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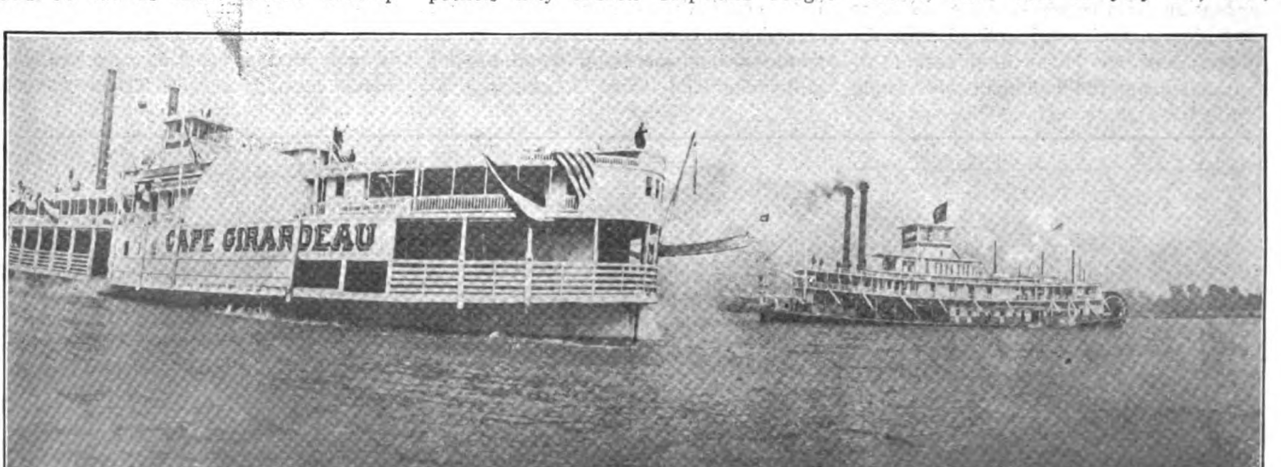
# The Panama Canal and the Middle West

BY ROBERT ISHAM RANDOLPH, SECRETARY INTERNAL IMPROVEMENT COMMISSION.

Col. Geo. W. Goethals in his recent testimony before the senate committee on the Panama canal has furnished some what of a sensation. The original estimate of cost of the high level, lock canal, as given in the minority report of the board of consulting engineers and as approved and authorized by congress, was $189,750,000; which included the purchase price of $40,000,000, the amount paid the French government for the concessions; and an indemnity of $10,000,000 paid to the Republic of Panama. Of the remaining $139,000,000, 20 per cent was allowed for administration, while no estimates were made for cost of sanitation, policing and zone government. Complete surveys had been made of the route, all the necessary data for estimates of quantities were available, and so far as most recent developments show nothing has occurred to discredit these estimates. Unit prices were estimated after a careful analysis of costs of similar works of first magnitude in this country and abroad, balanced against unusual conditions and low efficiency of labor on the isthmus. From all the data and information available through the regular channels nothing can yet be gleaned to discredit these unit prices. This naturally suggests the query.

Why does Col. Goethals venture the opinion that the cost of the completed Panama canal will amount to the stupendous total of $300,000,000, an increase of more than 50 per cent on the original estimate of the board of consulting engineers? There have been many changes of adminstration on the isthmus since we went down in our pockets fifty million deep and bought the wrecked French enterprise; and it is only natural that the latest "man with the hoe" should want to wait and compare his furrow with those of his predecessors before he makes any boast about what he can do in the digging line.

The width of the locks has been increased from 100 ft. to 110 ft., increasing the cost of these structures as orignally estimated 10 per cent, but that only amounts to $5,000,000, an inconsiderable part of the increased cost. The 10-hour day, which was the basis of calculation in the original estimates, has been reduced to a day of "8 hours work, 10 hours pay," and which increases the original cost 20 per cent. Sanitation, municipal improvements and civil administration, items not included in the original estimate, have cost to July 1st, 1907,




PRESIDENT ROOSEVELT IS THE FIGURE ON THE FORWARD DECK OF THE MISSISSIPPI. HE IS LIFTING HIS HAT IN SALUTE TO THE GOVERNORS OF THE FOURTEEN MISSISSIPPI VALLEY STATES ON THE CAPE GIRARDEAU.

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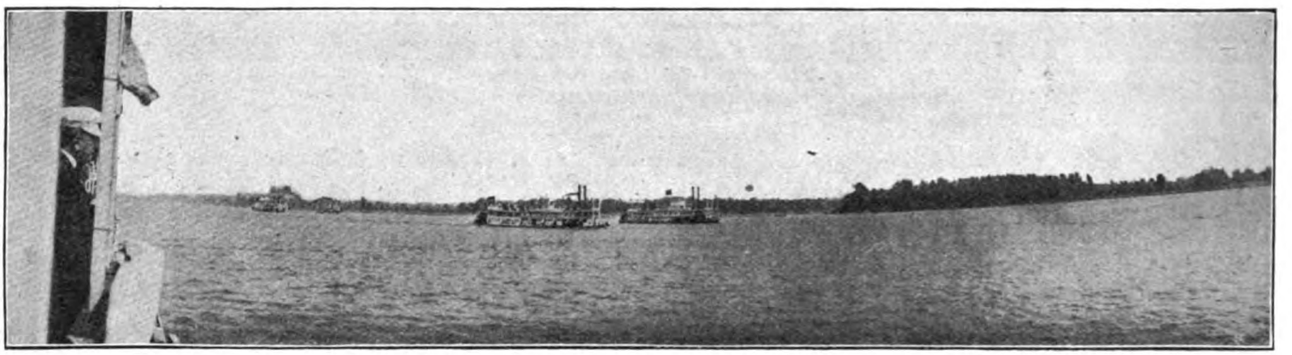
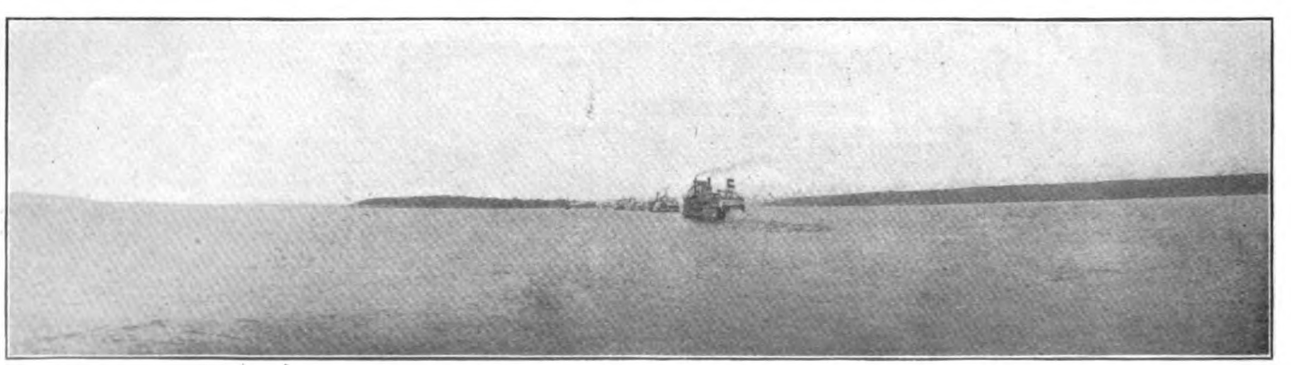


STEAMER HORTWIG AND MISSISSIPPI, IN CENTER, JUST BEFORE COLLISION.

nearly $10,000,000 and still there is a large balance of increased cost unaccounted for.

Notwithstanding the fact that we have been watching the monthly summaries of excavation as they have appeared in the columns of that most interesting government publication, the Canal Record, and have seen the monthly yardage mount steadily up until it has eclipsed all previous records for canal or engineering construction anywhere; and notwithstanding the fact that we have read the monthly summaries of expenditures in the same bulletin, we have seen no revised estimates of quantities and analyses of costs and until we do we must reserve judgment. Quite naturally the present adminstration will prefer to use its own data; its own cost records; its own computations of quantities excavated and quantities remaining; and make its cost and analyses and its estimates of completed cost from this data. One thing the chief engineer is willing to commit himself on now, and that is the estimate of time required for completion. The board of consulting engineers estimated that it would require eight and one-half years from the inception of the work, June, 1906, to complete the channel and turn in the water; and we have the pleasant assurance from the one man who ought to know, that this promise will be fulfilled.

Three hundred million dollars is a great deal of money. Our foreign commerce now amounts to $3,000,000,000 a year, the interest on which at 5 per cent for two years would build the canal. We have paid our old soldiers, remarkable for their longevity, an average of $140,857,836 a year for the past 100 years and we are proud of it. At this rate we have paid out for the rewards of war, $1,197,291,606 in 8½ years; the length of time required to build the Panama canal. When measured thus $300,000,000 in 8½ years does not seem much. It's altogether profitless to try to put a money value on this great work and we can only point out some of its many elements of value in a general way. Take its value to the nations of the world, for instance. Consider its effect upon international commerce; our own foreign commerce, as noted before, amounts to $3,000,000,000 a year, and without getting lost in another maze of figures we can say that that is only a small part of the value of the commerce of the world. All of it won't go through the canal, but very little of it that comes this way bound for Pacific ports on the American continents, or for the orient, will take the long southern route around the horn, or through the Straits of Magellan. The old routes are all being relocated, shortened, straightened, double-tracked, ballasted with smooth seas; and to carry the analogy further, the steep grades are being reduced by reducing the hazards of stormy seas and perilous coasts. Consider its value to our own country; its strategic value in the movements of our navy, army supplies, etc. Our annual naval appropriation for the last 10 years has averaged $98,039,942; our doors open on both oceans, and the present Pacific cruise of the fleet that has grown from these enormous appropriations suggests the idea that it would take this splendid protective agency about one month to get around from our front to our back door, time enough to give a marauding force a considerable advantage. Through the short cut opened up by the Panama canal some 8,900 miles is lopped off of this circuitous route and an effective patrol of all our shore line is assured. We hold the key to both oceans and that possession is the most potent factor in the maintenance of a world peace. Its value to our coasting trade is considerable. One of the arguments advanced in favor of the canal when we were first considering it was that it would carry an estimated tonnage of 6,000,000 tons yearly,



THE FLEET BELOW CAIRO.

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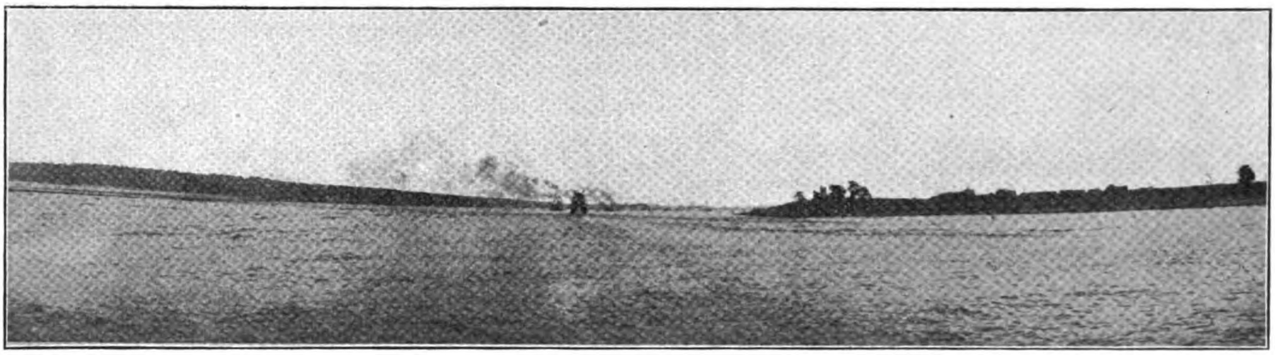


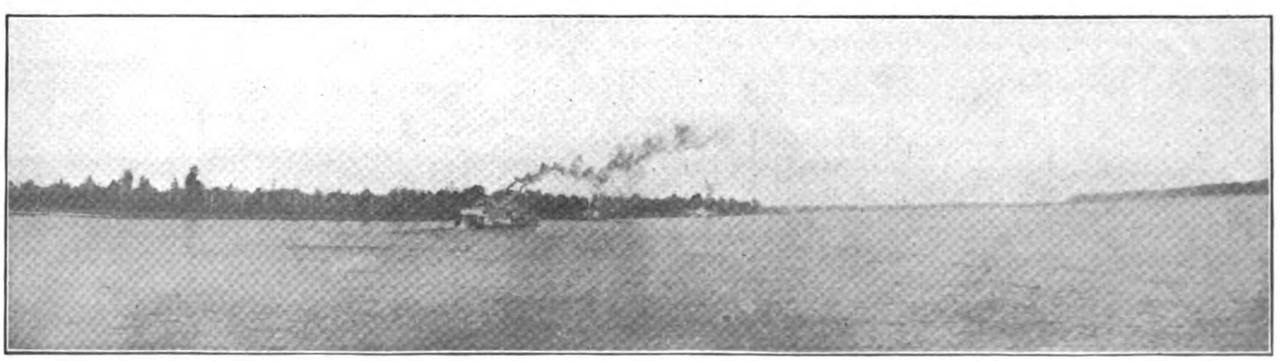
THE FLEET PASSING NEW MADRID.

the revenues from which would pay for cost of operation and maintenance and interest on investment. The Suez canal in 1904, passing the combined commerce of Europe and Asia, carried 11,500,000 net tons. The locks at Sault Ste. Marie at the head of Lake Superior, carrying the commerce of our inland seas, the great lakes, carried for the eight open months of the year a net tonnage of 31,546,106, in the same year, with an estimated value of $334,502,686, and last year this was increased to a tonnage of 58,217,214 with an estimated value of $537,463,454—a tonnage greater than that carried by the four great European canals—the Manchester ship canal, the Kiel canal, the North Sea canal and the Suez canal. Our South American trade which amounts to $40,000 000 annually in imports and double the amount in exports, taken with the trade that will take immediate advantage of this release from long continental rail hauls from the Atlantic to the Pacific seaboard and coupled with the through shipments from our Atlantic coast to the orient, and from our Pacific coast to the occident, will bring a tonnage through the canal that will make the original tonnage arguments *pro*, flop to an appearance of an argument *con*. Conceding, then, the value of the Panama canal to the nations of the world; granting its strategic and economic value to our own country, and putting aside quibbles of cost, we can look into the interior and see how far these benefits are going to permeate into the great centers of production and wealth of our land.

The middle west has got to get to the seaboard to enjoy these benefits, and if we must discount them by long rail hauls, high rail tariffs and inadequate shipping and terminal facilities what will it profit us? The railroads aren't numerous enough, the equipment is inadequate and the terminals are cramped. In 1906 the freight tonnage handled by the railroads in the United States, as given in Poor's Manual, was 1,610,099,829 tons; the average haul per ton was 135 miles; this gives in round numbers 216,000,000,000 ton-miles hauled, at an average charge of 7.7 mills. The railroad man would tell you that this is the absurdly small amount of ¾ of a cent, but I want to use the smaller unit as a basis, for the sake of some comparisons. At present we are going through an economic maelstrom—we don't know exactly how we got into it and we don't know just when we are going to get out of it: every man isn't "paddling his own canoe" very *fast*, but each one is steering as best he knows how and trying to keep off the rocks. From one quarter we hear the cry "overproduction," from another, "overcapitalization," and from yet another we hear whispers of $5,000,000 plots, political intrigues and deliberate intent to precipitate a panic. Wait till the storm lifts and the fellow who had the right theory can say, "I told you so."

I have a theory that was suggested by a statement of the secretary of the American Railways association which recently held its annual convention in Chicago. This gentleman is quoted as saying that one year ago there was a shortage of 150,000 freight cars in the United States, while today there are 350,000 cars to which he applies the opprobrious epithet "Teddy Bear Cars," standing idle on side tracks. Overproduction, overcapitalization, plots and counterplots are wide of the mark; the industries of the country are standing still, waiting for the railroads to catch up.

"Whatever affects the transportation facilities of the middle west, touches its economic life at the very center." The transportation facilities of the middle west have been swamped, 350,000 "Teddy Bear Cars" to the contrary notwithstanding. The middle west is the great center of production of the United States and a glance at the accompanying map, which is very largely copied from a circular put forth by the Merchants' and Manufacturers' Association of Kansas City,



THE FLEET ABOVE MEMPHIS

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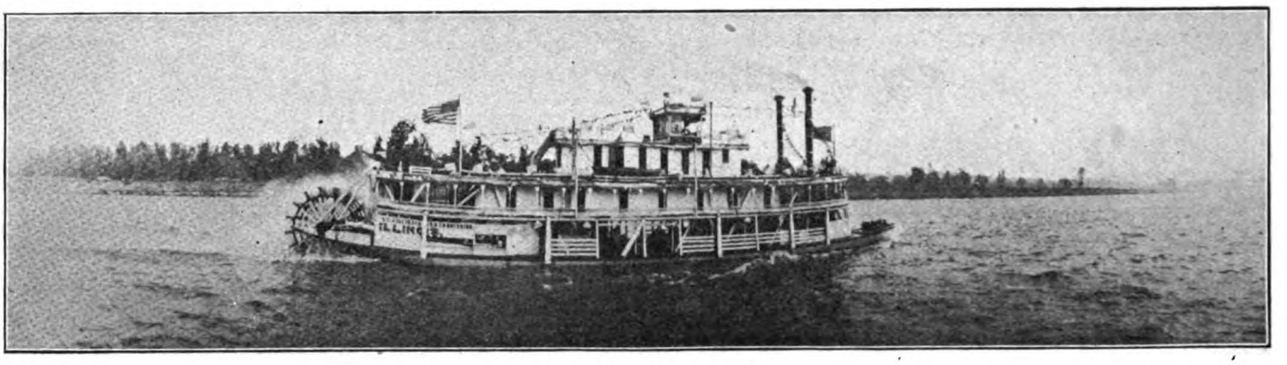


RIVER STEAMER ILLINOIS.

shows the location of the centers of production of all the principal commodities; all of them within the Mississippi valley—the middle west. Of the $88,500,000,000 of wealth in the United States the middle west is to be credited with more than half, and the internal revenue reports show that the states within the Mississippi watershed pay 70 per cent of the internal revenues of the country. Take the agricultural and live stock products of the country whose centers of production are shown on the map, and their values are given as compiled by the department of commerce and labor for the year 1905 as follows: Corn, $1,166,626,499; wheat, $490,332,760; oats, $306,292,978; cotton, $640,311,538; horses, $1,846,578,412; mules, $428,063,613; hogs, $417,791,321; cattle, $881,557,398; sheep, $204,210,129.

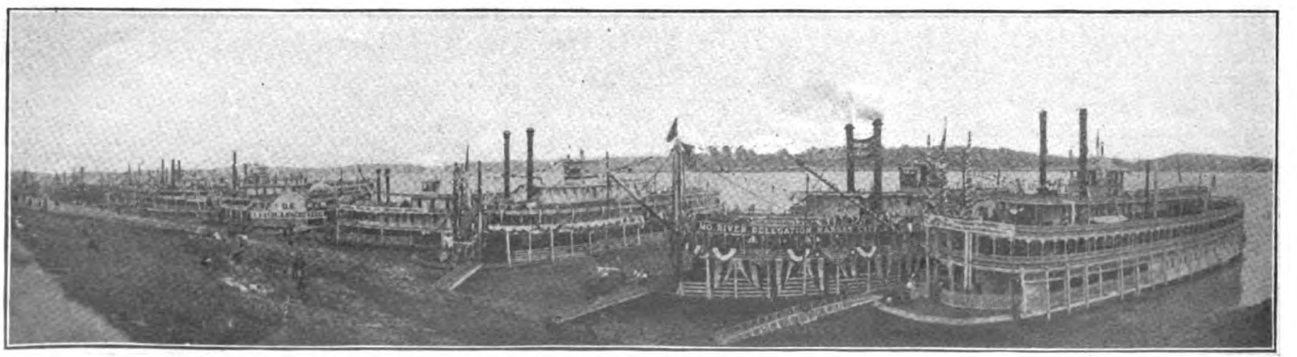
Glance at the following table of the volume and value of the mineral products of the United States, and note from the map that the centers of production of these products are all within the Mississippi valley.

MINERAL PRODUCTS OF THE UNITED STATES, 1905.

| | Quantity. | Value. |
|---|---|---|
| Gold, troy ounces..... | 4,265,742 | $ 88,180,700 |
| Silver, troy ounces.... | 56,101,600 | 34,221,976 |
| Copper, pounds .....901,907,843 | | 139,795,716 |
| Zinc, short tons..... | 203,849 | 24,054,182 |
| Lead, short tons..... | 302,000 | 28,690,000 |
| Coal bituminous) short tons .....315,259,491 | | 334,877,963 |
| Coal (anthracite) long tons ..... | 69,339,152 | 141,879,000 |
| Iron (pig) long tons.. | 22,992,380 | 382,450,000 |

A table of volume and value of our manufactured products would make a volume in itself; suffice it to say that the yearly aggregate value of our manufactures is, in round numbers, $17,000,000,000. A glance at these figures might lend color to the cry of "overproduction." Not so; there is no over-production, but a lack of adequate transportation facilities. There is a market for all of it and it all has to be handled, raw material or finished product, and often it must be handled three or four times over. Not only must it be handled, but it must be handled at a cost that will not strangle production. As mentioned before, the average charge for freight hauled by rail in the United States is 7.7 mills per ton mile. Compare this with the average charge of 0.84 mill per ton while for the freight traffic of the great lakes as given in the statistical report of lake commerce passing through the canals at Sault Ste. Marie, and you will find that the water rate is less than one-ninth of the rail rate. In 1906 the commerce of the great lakes amounted to 51,751,080 net tons. This was carried an average distance of 842 miles, giving a ton mileage of 43,596,953,680. The ton mileage of the railroad freight traffic in the United States during 1906 was 216,653,795,696.

This lake commerce was carried for some $36,000,000, while if it had been carried by rail the same distance at the prevailing rates it would have cost some $335,000,000, showing a saving in water transportation in one year of about $299,000,000. Again, if the total railroad tonnage had been carried by water at the prevailing rates it would have cost $181,000,000 as against the cost of $1,668,000,000 by rail, showing a saving of $1,487,000,000 in favor of the water haul. To get down to a close range illustration, take the case of the "Pittsburg manufacturer who testified before a congressional committee that his coal was brought from the mines to his mill via the Monongahela river route, for 3½ to 4 cents a ton, and that when river traffic was suspended for any reason the railroads charged him 44 cents a ton for the same service." Col. John L. Vance, president of the Ohio River Improvement Association, is authority for the statement that heavy freight is carried on the Ohio and Lower Mississippi for one-third of a mill per ton mile, this figure including return of empties and leaving a handsome margin of profit; and it is claimed that bulky commodities have been floated down this stretch for 0.1 mill per ton mile. Some further rate comparisons are found in the statistical abstract of the United States. The rate on wheat, for instance, from Chicago to New York via lake and canals



THE LEVEE AT CAIRO.

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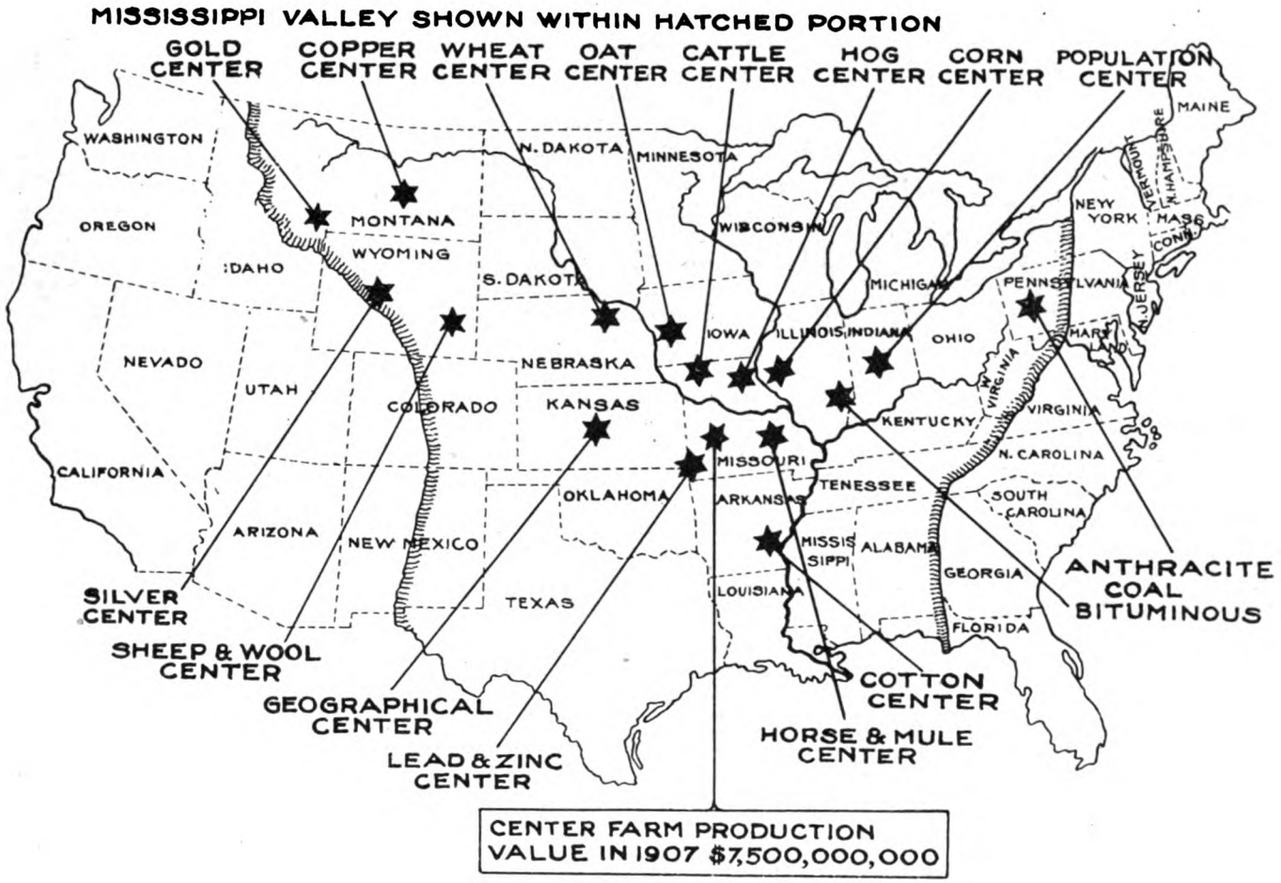


was 5.51 cents per bu. in 1905; by rail the rate was 10.2 cents per bu. Wheat from St. Louis to Liverpool in 1900 had a rate via New Orleans by river of 14.64 cents, while by rail via New York the rate was 18.41 cents. Further comparisons of water and rail rates would be vain repetition. The figures given shout out the remedy to be applied to inadequate and high priced carrying facilities. We can build more railroads but we can't get the cost of transportation down, and to build more railroads and neglect our internal waterways is to spend more money than is necessary to give relief and to saddle on producers a remedy limited in capacity and costly to maintain.

The government appropriations for river and harbor work are only about 4 per cent of the net appropriations, while the navy gets 26 per cent and the army 17 per cent. The bayonet and the battleship versus the shovel and the dredge; the ratio is wrong. We do not claim that the army and navy appropriations are too large, but we do assert that appropriations for our internal improvements are too small; and we do contend that it is poor economy to expend 43 per cent of the national revenues to protect an internal commerce, to create and maintain which only 4 per cent of those revenues is contributed. Our naval policy is fixed, and we hope we have something of a permanent investment from the 43 per cent, but we should adopt a policy of internal improvement on a proportionate basis. President Roosevelt said in his Memphis address: "The one intolerable position for a self-respecting nation, as for a self-respecting man, is to bluff and then not be able to make good. We have accepted the Monroe doctrine as a cardinal feature of our foreign policy,.....we have got to make good. We need the bayonet and the battleship to keep our great sea highways clear, but we need the shovel and the dredge to open up and to keep open our inland waterways. The average cost per mile of canal is about four times that of the railroad, but the cost of maintenance and equipment throws all the balance in favor of the waterway. Our small steamers will tow down the Mississippi river barges carrying from 50,000 to 70,000 tons of coal. The smaller quantity named would demand for its conveyance by rail 42 trains of 40 cars, carrying 30 tons each. Each train would require more men to operate it than the steamer and barges would need, while one train would cost nearly as much as the tug and all its barges. The barge line has neither roadway to maintain nor thousands of cars and locomotives to purchase and keep in repair. Neither does it have to collect 7.6 mills per ton mile for conveyance of freight in order to pay large operating expenses and fixed charges, when a profitable and remunerative business can be conducted in carrying freight by water for one-fourth of a mill per ton mile."

Handling, loading and unloading freight is no inconsiderable item in the cost of transportation and here again water transportation has the advantage. Railroad freight must be cut up into small packages of 25 to 30 tons each, while water freight is carried in one big bundle, ranging in size from 100 to 14,000 tons. Vessels are loaded and unloaded in an incredibly short time by the modern machinery; huge

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car dumpers pick up ore and coal cars and dump the contents bodily into the hold of the vessel; 5,000 tons of ore can be thus loaded in about three hours; and 100,000 bu of grain can be loaded into a vessel in about one hour and discharged in three. The ton of coal is now carried from Buffalo to Duluth for about the cost of shoveling it into the cellar from the sidewalk. Through shipments without breaking bulk reduce the cost of transportation, and notwithstanding the fact that the central portion of the Middle West is 590 miles nearer to San Francisco and western South American ports via Panama than New York, we are forced to ship our commodities half way across the continent to the seaboard and then to re-handle them for the benefit of this water haul that is so many miles longer than the one at our very doors. The great railroad trunk lines of the country are east and west lines all practically crowding into one congested Atlantic terminal. The great natural avenues of commerce spread a network over the middle west, touching every center of production and offering terminal facilities and distributing stations at a hundred different points. Adequate development of these natural resources will not serve alone to open the way to carry our commodities to a market, but it will in fact bring the market to our very doors.

The large volume of shipping on the great lakes, for which figures have been given before, is all handled during only eight months of the year. For the other four months the northern passage is blocked with ice and this great lake fleet is tied up at the docks idle, its earning power suspended. A development of one of the arteries of the great inland waterways would let this corked-up fleet out of the bottle and extend its usefulness and its earning power through the whole twelve months of the year. Lake shipowners would find the coasting and South American trade a very attractive field and producers all along the 1,625 miles of the trunk line from Chicago to the Gulf of Mexico would benefit thereby. Lake shipyards are building larger vessels every year and for the reason that they are located right in the heart of the steel industry with rolling mills and plate mills right at hand they can turn out their product much cheaper than the seacoast shipyards can. With a deep waterway to the Gulf these ship yards will be strong competitors to the sea coast yards; ocean going vessels will be launched in fresh water and perhaps a beneficent government will turn some of the enormous annual naval appropriation inland and we shall see gunboats and cruisers built and launched on the lakes and floated down the inland highway to patrol the highways of the sea.

President Roosevelt in speaking on the general subject of inland waterways, said: "Where the immediately abutting land is markedly benefited, and this benefit can be definitely localized, I trust that there will be careful investigation to see whether some way can be devised by which the immediate beneficiaries may pay a portion of the expenses." In the case of the lakes-to-the-gulf waterway, the state of Illinois has already acted in accord with this policy. The Chicago Sanitary and Ship canal, completed at a cost of over $50,000,000, is the first great link, 36 miles in length, of this waterway and the state is prparing to vote on a constitutional amendment authorizing its legislature to issue $20,000,000 in bonds to complete the second great link from Lockport, Illinois, to Utica, Illinois. In May, 1905, the Illinois legislature passed an act entitled: "An Act to provide for the appointment of an Internal Improvement Commission and to make an appropriation therefor," and in February, 1906, the governor of the state appointed such a commission. This commission has carefully considered all the questions involved and has reported on a plan of development from Chicago to St. Louis. From Lockport to Utica, the stretch which it is proposed that the state shall build, the commission recommends a development of five lift locks and four pools, giving deep and wide channels for navigation and providing a potential water power of 173,000 H. P. Here again we have anticipated the president of the United States, who says: "Still another fundamentally important question is that of water power. Its significance to the whole country and especially to the west is just beginning to be understood..... It is computed that the annual value of the available but unused water power of the United States exceeds the annual value of the product of all our mines. Furthermore, it is calculated that under judicious handling the power of our streams may be made to pay for all the works required for the complete development and control of all our inland waterways."

The significance of this water power development is fully understood in Illinois, at least, for we understand that the revenues from this power are sufficient to operate and maintain our locks, to pay the interest on our bonds and eventually to retire the issue. Thus we are making this waterway develop itself without putting one cent of tax on our people. Illinois is preparing to give to the Union a link in the waterway that will contribute more than two-thirds of the total cost of the project from Chicago to St. Louis. That's practical patriotism.

Last fall our president discovered the Father of Waters and we hail him as the "Avant courier" of inland waterways development who has blazed the trail for the Middle West. This is the sign which he hung up in the wilderness of our economic struggle: "There is a great national project already under way which renders the improvement of the Mississippi river and its tributaries specially needful. I mean the Panama canal. The digging of that canal will be a benefit to the whole country, but most of all to the states of the Pacific slope and the Gulf; and if the Mississippi is properly improved, to the states through it flows."

## JONES STOKERS ON THE BIG DREDGE FRANCIS T. SIMMONS.

The Under-Feed Stoker Co. of America, Marquette building, Chicago, is installing an equipment of eight Jones stokers on the dredge Francis T. Simmons, owned and operated by the board of commissioners for Lincoln park, Chicago. Work on the installation, which provides for the equipment of two internally-fired, double-ended boilers of the gunboat type, each having four furnaces 45 in. in diameter by 7 ft. 6 in. in length, is well under way and will permit placing of the dredge in commission at an early date.

Without exception the Francis T. Simmons is the largest hydraulic dredge ever built and operated in the United States. She was constructed especially for the Lincoln park board of commissioners for the purpose of filling in an area immediately adjoining the park on the north, which, when completed will double the size of this far-famed park.

The dredge was put in service last season and when at work is anchored opposite the park a short distance out in Lake Michigan, working in depths varying from 10 to 35 ft. This fact of proximity to the park makes the matter of smoke abatement of utmost consequence and it is for the purpose of effectually abating the nuisance that Jones stokers were contracted for installation.

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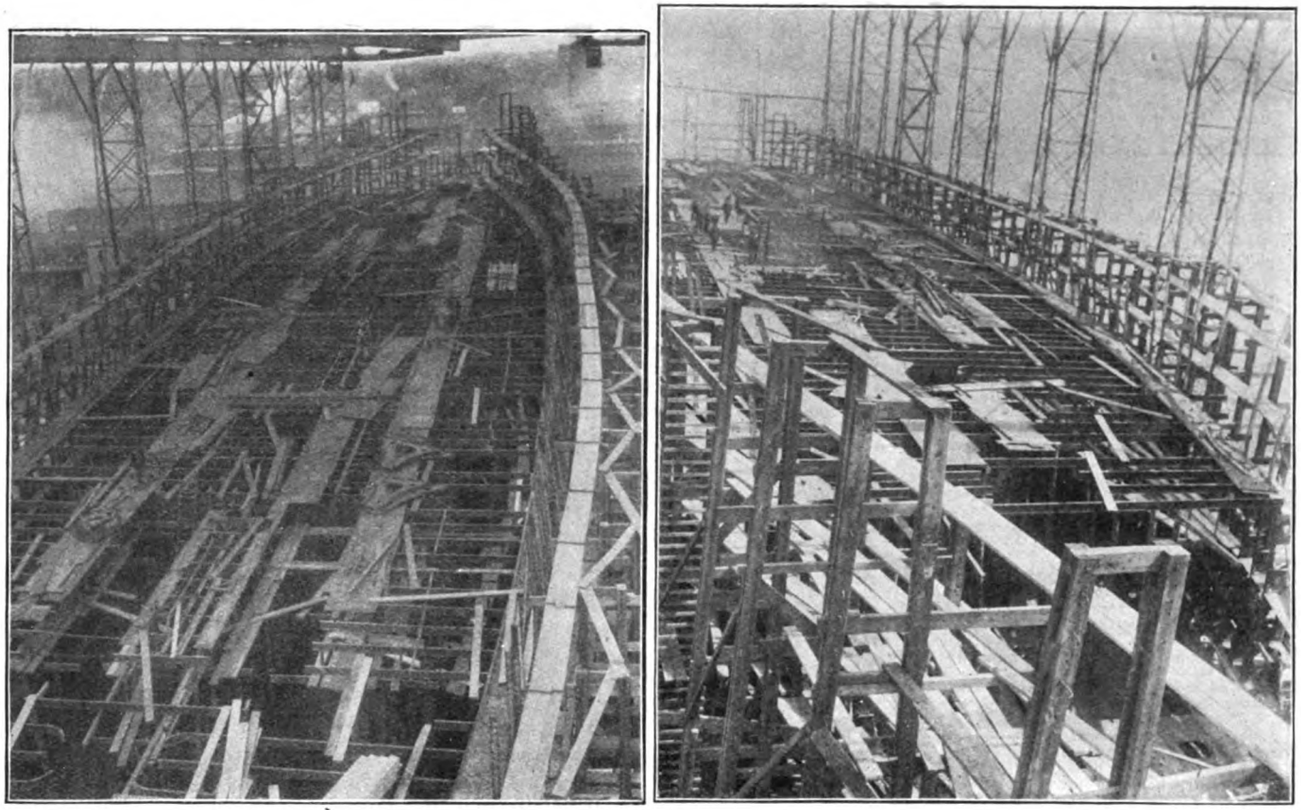

BATTLESHIP NORTH DAKOTA ON APRIL 1.

## BATTLESHIP NORTH DAKOTA.

Photographs are herewith published showing the battleship North Dakota as she appeared on April 1, at which time the vessel was 25.7 per cent completed. The amount of staging at present about the ship makes it practically impossible to get a good view of her construction at present.

## NEW STEAMER ISTHMIAN.

The new steamship Isthmian, the latest addition to the rapidly growing American-Hawaiian fleet of large freighters, has just been given her trial around San Francisco Bay. Her maiden trip proved very successful and satisfactory, both to the Union Iron Works Co. and the owners of the new vessel. The Isthmian is 385 ft. long, 50 ft. beam, and with a depth of 28.6 ft. She has an I. H. P. of 3,000, displacement of 11,000 tons, cargo capacity of 7,000 tons, and will be able to make a speed of 12 knots an hour. She is to be used on the route between New York and Puerto Mexico, connecting with the Tehuantepec railroad, which is under lease to the American-Hawaiian Steamship Co. President George F. Dearborn, of the line, is now in San Francisco.

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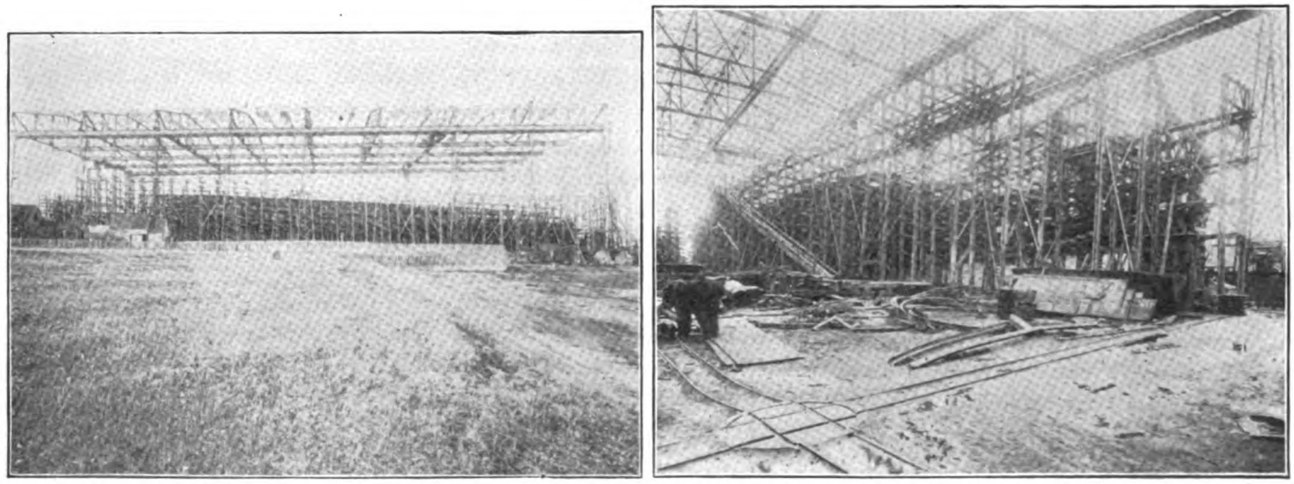
Capt. Robert A. Jones, well-known lake master, died at Buffalo last week at the age of 85 years. He sailed some of the earliest boats on the lakes and was for many years identified with the Anchor Line. His last command was the schooner Maxwell, of which he was part owner.



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April 9, 1908.

## OCEAN MAIL ACT.

The ocean mail act as passed by the United States senate was considered this week by the house committee on post offices and post roads. There is better prospect for the passage of this bill at the present session than there ever has been before. Interests which were hostile to the measure at the last session of congress have been persuaded to support this one. The measure is believed to have a working majority in the house, and it is not expected that opposition will be active. It may be that a roll call will not even be demanded.

Much credit is due to the diplomacy exhibited by President Roosevelt in bringing about this condition of affairs. He had consistently urged congress to promote the country's ocean mail service. In his opening message he strongly recommended legislation for a better and faster mail service to South America, the Philippines and the orient. There has been no effort to ask for subsidy, but simply that our postal facilities abroad may be improved.

The bitterly hostile attitude toward ship subsidy legislation shown in the last congress by the Democrats led many to believe that no change of phraseology, or, for that matter, change of essential features of the legislation, would have the effect of diminishing Democratic opposition this year. But Mr. Roosevelt has shown great tact in his advocacy of the legislation. He has had many conferences with senators and representatives who have been opposed to legislation of this character. In these conferences he has attempted to point out that the question is not political, and involves no change of principle. He has urged that it be supported by both Democrats and Republicans. Mr. Roosevelt has not confined his discussions of this subject to Republicans, but has talked the matter over also with Democratic senators and representatives. Early in the session he enlisted the support of Senator Simmons, of North Carolina. Mr. Simmons is one of the most ardent supporters of Senator Culberson, the minority leader, and it was due largely to his efforts that no request was made for a roll call when the Gallinger bill passed the senate on March 20.

When the Gallinger bill was received by the house it was referred to the committee on post offices and post roads. In former years all ship subsidy legislation has been considered by the committee on merchant marine and fisheries. The original legislative plan was to have the committee on post offices and post roads attach a "rider" to the post office appropriation bill, which should embody the essential features of the Gallinger bill. Accordingly, a bill similar to the Gallinger bill was introduced in the house by Representative Humphreys, of Washington, and referred to the committee on post offices and post roads.

At the time the post office appropriation bill was considered an effort was made to have the Humphreys bill engrafted on it. The Democrats on the committee opposed this motion; and it was defeated by a tie vote, Representatives Stafford, of Wisconsin; Murdock, of Kansas; and Steenerson, of Minnesota, Republicans, joining with the Democrats.

The Gallinger bill is an amendment to the act of 1891, which provides four classes of vessels which may receive government aid for carrying the mails. It is proposed by the bill to give authority to the postmaster-general to pay vessels of the second class at a rate per mile not exceeding the rate applicable to vessels of the first class. In other words, if this bill becomes a law the postmaster-general may enter into contracts to pay $4 a mile for ocean mail service, on the outward trip, to all vessels having a speed of not less than 16 knots an hour which carry mail to South America, to the Philippines, to Japan, to China, and to Australasia.

Before Senator Simmons consented to support the bill he insisted that it be amended to provide that the total expenditure for foreign mail service in any one year shall not exceed the estimated revenue therefrom for that year. Mr. Simmons talked over this amendment with the president and with Senator Gallinger, and it was adopted without opposition. It is not expected there will be opposition to it in the house committee.

Advocates of the pending legislation have insisted from the start that the government is now enabled to make a profit of $3,000,000 a year by rendering an inefficient ocean mail service. All that was desired, it was said, was that the government should expend this profit in building up the ocean mail service. "Every dollar of that three millions is made at the expense of the commerce of the country," was the way Senator Gallinger put it.

In reporting the bill Senator Gallinger said that assuming that the post office department would contract for a fortnightly service to Rio de Janeiro and to Buenos Ayres, to Manila, over two routes across the Pacific, one via Hawaii, one direct, and a service once in three weeks from the Pacific coast to Australasia, the compensation to be paid under his bill would be $3,630,320. "This," he said, "was an estimate for the maximum amounts that could be paid."

The senate also agreed to an amendment proposed by Senator Bacon that if no contract is made for a line of ships between a port on the Atlantic coast, south of Cape Charles and South American ports, the postmaster-general shall, provided two or more lines are established from North Atlantic ports, require that

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one of the lines shall, upon each outward and homeward voyage, touch at least two ports on the Atlantic coast, south of Cape Charles. It is probable the house committee will accept this amendment, and that the bill will be passed in the form that it passed the senate.

## OPEN SHOP ON THE LAKES.

One of the most significant meetings that the Lake Carriers' Association has ever held will open at the Colonial hotel in Cleveland on Thursday. Meetings preliminary to this general one have been held in Cleveland and Buffalo during the past two weeks and the policy to be formulated at the coming meeting is fairly well outlined. There is not a glimmer of light to be seen in the trade of the great lakes for 1908. As far as business is concerned the outlook is discouraging. The movement of ore from dock to furnace has been practically nil during the winter. Of the 600,000 tons on one of the docks in Cleveland on Dec. 1 last, only 40,000 tons have gone forward to furnaces. The Steel Corporation alone has 12,000,000 tons on its docks and in its furnace yards, and of the grand total brought down last year, probably 20,000,000 tons is still unconsumed. Furnace men are neither buying ore nor inquiring for any.

The early estimates of a movement of 30,000,000 tons for the present season have now been reduced to 25,000,000 tons. The present lake fleet in an average season has a capacity equal to 50,000,000 tons of ore. The tonnage available for last year's business could easily have moved 50,000,000 tons. With ore shipments cut in half it is clear that the only adequate remedy is a short season. Everyone recognizes this and all agree to it. If a general start is not made until June 1, which is the date now spoken of for a general movement, the fleet will be kept reasonably busy during the balance of the season.

Notwithstanding the weakness of the general situation, there is no disposition to reduce wages or to cut the freight rate. This is in complement to the policy formulated by the steel men who are endeavoring to maintain prices. Vessel men, however, believe that the time has come to insist upon more equitable conditions aboard ship. They have not the slightest desire to reduce the earnings of the employes, but they do think that the management of the property should remain with the owner. With the exception of masters and mates, all members of the crew belong to unions. Instances have not been rare wherein the master or mate has found himself unable to enforce orders. Obviously this is an unsupportable condition and a stand in favor of the open shop will in all probability be taken by the Lake Carriers' Association.

For a long time past the managers of the leading fleets have been desirous of dealing with their engineers direct instead of through their organization, the Marine Engineers' Beneficial Association. For that reason few of the leading fleets have as yet appointed their engineers. The engineers of the Pittsburgh Steamship Co. this week agreed to deal with the company as individuals and not as an association. In point of fact, some of the engineers have been anxious to bring about this condition of affairs for some time, believing that they could make better terms as individuals. Hereafter this company will deal directly with the individual engineer.

## MARINE INSURANCE POLICY.

The insurance policy that underwriters will offer to vessel owners of the great lakes on steel tonnage of the highest class for the season of 1908 is, to use the expressive language of one of the vessel owners, a corker. Prior to 1907 valuation was at $40 per gross ton register. During 1907 it was advanced to $48.50 per gross ton for first valuation. The insurance rate was 4½ per cent with ⅜ per cent for protection and indemnity and 1⅜ per cent for total loss. The deductable average was $500 and the season extended from April 1 to Dec. 5. This policy was a stiff one compared with former years, but the 1908 policy is far stiffer. This year valuation is based at $53.50 per gross ton. The rate has been advanced to 5 per cent with ½ per cent for protection and indemnity and 1⅜ per cent for total loss. The season is to extend from April 15 to Dec. 5, with no recovery for ice damage unless it amounts to 3 per cent of the first valuation of a ship. Hitherto owners who did not care for fire and winter insurance were permitted ½ per cent reduction, but this privilege is now withdrawn.

This drastic policy has caused considerable comment, but underwriters insist that the conditions which they are forced to meet have compelled it. The underwriters declare that they have been forced to advance rates owing to excessive losses and they are not slow in saying that certain owners have thrown upon the underwriters burdens that they should not in equity be asked to bear and that owing to the fact that a few abuse insurance privileges, all have to suffer by a horizontal advance in the insurance rate. Owners of high class tonnage who operate their vessels with the greatest care maintain that the new policy is unjust to them, while at the same time admitting the force of the underwriters' contention. The fact remains, however, that neither the valuation nor the rate would be as high as it is were it not that the statistics of accidents and losses support it.

## PIG IRON SITUATION.

The pig iron market continues extremely dull, and persistent reports of $12 Birmingham being shaded are heard. In the central west, leading producers who have been adhering to the Cleveland agreement made in February, have lowered their quotations from $17.35 for No. 2 foundry to $16.50 and $16.75 from local furnaces, but still all are acting in harmony. Effort is being made to obtain the co-operation of southern interests in the effort to maintain reasonable prices.

The outlook for the purchase of rails is reported to be somewhat more hopeful, but few orders have been placed as yet. The prospect for building operations is brighter, and it is expected that at Chicago contracts for about $20,000 tons will soon be placed. The cotton tie market has opened, and there is fair activity in hoops and bands and prices are fair. The demand for steel tubing, as well as cast iron pipe is better. An increasing demand for sheets continues. The United States Steel Corporation has 50 per cent of its sheet mills in operation.

Coke production has decreased, the demand is limited, and prices are irregular.

The monthly blast furnace statistics show a total production of 1,234,359 tons for March. This means a daily production of 39,476 tons for March, as against 36,476 tons for February, and 34,316 tons for January.

## LAKE LAUNCHINGS.

(Continued from page 29.)

G. Sanky, Mr. and Mrs. R. R. Wallace and Capt. George W. Symes.

The Thompson is 520 ft. over all, 504 ft. keel, 55 ft. beam and 30 ft. deep, having triple-expansion engines, 23½, 38 and 63-in. diameters by 42-in. stroke, supplied with steam from two Scotch boilers, 14 ft 6 in. by 11 ft. 6 in., equipped with Ellis & Eaves draft and allowed 180 lbs. pressure. The Thompson will be operated by the Valley Steamship Co., and this company has been incorporated to embrace the whole Becker fleet.

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# PRIZE WINNING ESSAYS

## The Second Prize Essay in the Competitive Contest Originated by the Merchant Marine League of the United States.

The second prize in the competitive contest among students offered by the Merchant Marine League of the United States upon the subject "How to Upbuild the Merchant Marine of the United States," was won by Wm. P. Munger, Sigma Nu House, Terrace place, Nashville, Tenn. The judges in commenting upon his essay wrote:

"He has made a careful compilation of evidence and has given more than ordinary attention to the preparation of his manuscript. He discusses five means of upbuilding the merchant marine and then proposes a composite measure, embracing bounties for ship construction, mail compensation, a subsidy to cargo vessels and deep sea fishing. He would meet this expense with an increase in tonnage tax, showing how it would work out in probable practice. He has apparently put a great deal of time upon the paper, probably more than any other competitor. His plans are elaborate, but are worthy of consideration."

Wm. P. Munger was born in Bergen, N. Y., in 1855, of New England parentage. At the age of 8 years his parents moved to Rochester, N. Y., where his father was engineer of the Electric Conduit System. He graduated from the grammar schools at Rochester in 1901, taking first honors. He then entered the Rochester high school, graduating in 1905. In the fall of 1905 he entered the university of Rochester. He spent his vacations in survey work in the city engineer's office at Rochester. He relinquished a position in the Rochester Railway & Light Co.'s drafting room to take charge of the preliminary survey party on the Nashville Railway & Light Co.'s conduit system. He entered as sophomore B. S., Vanderbilt University, in the fall of 1906, where he is at present.

### IMPROVEMENT OF AMERICAN MERCHANT MARINE.

BY WILLIAM P. MUNGER.

Admiral Dewey, in a letter to congress, November, 1905,* after commenting on the condition of the American merchant marine, and the resources of the navy, wrote:—"It is thus seen that the navy department

MR. WILLIAM P. MUNGER.

would be compelled to secure in case of war from the merchant marine, 24 scouts, 16 squadron colliers, 2 slow colliers, 5 ammunition ships, 2 sup-

* 59c 1st S. R. 1 Appendix A.

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ply and refrigerating ships, 4 tank and distilling ships, 2 hospital ships, 4 repair and torpedo depot ships, 34 dispatch boats and district scouts, and 78 tugs. In order to be sure that this number of vessels would be available for immediate purchase or charter at the outbreak of war, the number of American-owned merchant vessels of each type should be largely in excess of the number here given, as some vessels would be abroad when needed, some under repairs, and some should be left for carrying on their regular commercial runs and as a reserve from which to draw in case of necessity." After going into detail as to the difficulty of getting auxiliary vessels at the outbreak of the Spanish war, and pointing out that the embarrassment would have been still greater if the operations of war had been more unexpected and against a more active enemy, he concludes with, "Another benefit which would accrue to the navy from a large fleet of American-owned merchant vessels would be, in the large number of experienced sea-faring men, engineers, and firemen accustomed to marine engines and boilers, who would form a valuable reserve from which to draw the men for manning the auxiliaries."

We are now carrying 8 per cent to 12 per cent of our exports and imports in American bottoms, which is to say, we are like the department store, which intrusted to a rival its delivery of goods. Soon A had complaints of short weight or damaged articles, and often that purchases were missing altogether, and then he instinctively began to see that human nature, being as it is, B had kept his good horses and sound wagons for his own use, and had quietly run in his spavined steeds and worn-out vehicles to convey the goods of his competitor. His customers transferred their business to his rival.

This is precisely what is happening today in South America. As was shown by testimony of the manufacturers of the entire country before the Merchant Marine Commission, merchants find it hard to get into the South American markets and harder still to stay there. They can never depend upon the starting of English and German vessels from New York. The United States sends no more marine deliveries of its own to Brazil or Argentina. Even the American mails must cross the Atlantic twice on the subsidized liners of England. The result is the inevitable one. We have lost our hold upon South America. WE ARE IN A PERILOUS CONDITION.

Methods of strengthening our merchant marine, and making our prosperity safe in peace or war, have for sometime been a subject of deep concern to many of our thoughtful men, but now the moans of a vital industry, dying from neglect, have so aroused the sense of fair play and self-preservation in men of all walks of life that some practical aid must be extended. Among the various plans which have been proposed, the following stand out as the most often discussed:

FREE SHIPS, DISCRIMINATING DUTIES, BOUNTY TO SHIP OWNERS BUILDING SHIPS, LARGER COMPENSATION FOR CARRYING MAILS. SUBSIDY.

FREE SHIPS mean, (1) nothing but free trade because that method allows all materials entering into the construction or repair of ships engaged in the foreign trade to be imported free of duty. The objections to this are, 1st, that all materials entering into the construction or repair of ships are now upon the free list,* and as chart 1 shows, this method has not built up our merchant marine. 2nd, that this policy would not help the merchants to pay increased running expenses after they were built.

(2) The building of ships in a foreign country and putting them under the American flag. This is bad policy because even if the ships were just as well built, American labor would be deprived of all that work and pay.

DISCRIMINATING DUTIES. The objections to the policy of remitting to consignees a certain percentage of the duties upon goods if imported in American bottoms, or to impose an additional duty if carried in foreign bottoms are:

1st. It would not benefit our very large export trade.

2nd. It would necessitate the abrogation of 30 commercial treaties, and to secure 30 more otherwise as favorable would be an almost impossible task.

3rd. The probability of retaliation by other nations is far too serious a risk to be taken.

4th. The quantity of goods on each voyage would vary, and the

*Dingley law, sections 12 and 13.

## STEEL CORPORATION REPORT.

The sixth annual report of the United States Steel Corporation for the fiscal year ended Dec. 31, 1907, shows that the volume of business done by all the companies during the year, as represented by their combined gross sales and earnings, equaled the sum of $757,014,767.68. This amount represents the aggregate gross value of the commercial transactions conducted by the respective companies, and includes sales made between the subsidiary companies, and the gross receipts of the transportation companies for services rendered both to subsidiary companies and to the public. The earnings for the year resulting from the above gross business represent the combined profits accruing to the several corporate interests on the respective sales and services rendered, each of which is in itself a complete commercial transaction.

The increase in the aggregate amount of business done by all companies in 1907 on the foregoing basis, as compared with the preceding year, was $60,257,876.67, divided as follows: Increase in sales value of products shipped to the public, $18,553,909.92; in sales value of products sold between subsidiary companies (including ore, coal and coke), $37,372,606.09; and in the gross earnings of the transportation and miscellaneous companies, $4,331,360.66.

The report is signed by Elbert H. Gary, chairman of the board of directors, and William E. Corey, president. In the general review of the year the report says:

"During the first 10 months in the year 1907 the several departments of the subsidiary companies were operated at substantially their maximum capacity. The production by the manufacturing properties of finished products for sale during the period from Jan. 1 to Nov. 1, 1907, showed an increase of 5 per cent over the corresponding period in 1906. Owing, however, to the sudden and severe check to general trade conditions which took place in the fall of 1907, the volume of business of the subsidiary companies was materially curtailed, resulting during the last two months of the year in a decrease in production of finished products which exceeded the gain made during the preceding 10 months. The production of finished steel products for sale in the entire year of 1907 shows a decrease compared with 1906 of 201,691 tons, or about 2 per cent. The decrease in actual shipments of products made to customers showed a somewhat larger falling off, 10,451,488 tons of all kinds of manufactured materials (including furnace products and scrap) having been shipped in 1907 against

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ship owner could not be sure business would be remunerative to warrant him in building and running vessels under this plan.

5th. It is not general in application, as many of the ports that we wish to make our free trade ports, or the articles carried are now on the free list.

BOUNTY TO SHIP OWNERS BUILDING SHIPS. This plan, in its best form, advocates the payment of a bonus to ship owners when new ships are commissioned from American yards. This amount bringing the net cost down to the foreign builder's figures. This plan would in no way bring down running expenses to the low figure of the heavily subsidized foreign Merchant Marine. It would be like deserting a child at its birth.

LARGER COMPENSATION FOR CARRYING MAILS. The present mail subsidy tends to build up fast steam lines with little cargo capacity, and to increase it, would probably drive our useful steam "tramps," the large and slow cargo sailing vessels, and the deep sea fishing vessels out of business.

SUBSIDY. This word is odious to the American people, mainly from a misconception of its application. A subsidy in the present case is only an equalization to ship owners for the yearly loss sustained by the increased cost of running under the American flag, the American laws requiring better housing and better food for the crew than the laws of foreign nations.* The forms which a subsidy usually assume are:

(1) A direct payment to ship owners per ton of freight per mile.

(2) A direct payment per registered ton mile.

(3) A direct payment per gross ton mile.

(4) A payment based on the number of days the vessel is engaged in foreign trade. 1, 2 and 3 would not be applicable to deep sea fishing boats, while No. 4 puts the American ship in a position to compete with the foreign ships, all of which have lower operating expenses. But it does not help the ships to spring into existence. As none of the above will by itself solve the problem,

WE THEREFORE PROPOSE AS A COMPOSITE MEASURE.

(1) A BOUNTY PAID TO SHIP OWNERS building ships of 40 per cent of the gross cost of all ships built for the foreign trade the first year, 30 per cent on all built the second year, 20 per cent on all built the third year, 10 per cent on all built the fourth, and none thereafter.* This plan would enable American capital to secure ships as cheaply here as abroad. Since American workmanship excels, this would create a demand for American ships, and give work to American ship yards and jobs to American labor. The more ships that are built, the more thoroughly organized the ship yards would become, and hence the lessened cost, and hence the diminishing rate of bounty.

(2) A GREATER MAIL COMPENSATION paid to lines of fast American steamers carrying all the mail between United States ports and designated foreign ports that our Postmaster General may direct. Besides supplying the extra vessels needed, this plan would also be a means of opening up new trade with South America, Africa, etc., for as soon as there is a good mail and passenger service with a foreign port, representative American houses go there, open a business, and so create a demand for freighters. We therefore propose to make contracts with American mail lines.* Vessels receiving this bounty are to be required to come up to specified tests as to speed and adaptability to government uses in war and be subject to no other bounty.

(3) SUBSIDY to cargo vessels and deep sea fishermen is the plan by which we propose to equalize the running expenses of that class of vessels. The number of months (computed in days and reduced to months and including the time necessarily consumed in making annual or extraordinary repairs and in receiving and discharging cargo) that a vessel has been in the foreign trade or deep sea fishing, is the basis on which we would grant the following subsidy:

This scheme seems desirable, from the evidence submitted to the Merchant Marine Commission of the 58th congress and published in their report.

| Period of time in foreign trade. | Subsidy earned. |
|---|---|
| 12 months of one year | $5.00 per registered ton. |
| 9-12 months of one year | $4.00 per registered ton. |
| 6-9 months of one year | $2.50 per registered ton. |

*See table 1.
*See table 2.

10,862,425 tons in the preceding year. Prices of steel commodities for domestic sale were not generally advanced during the year notwithstanding there were marked increases in the cost of raw materials and supplies used in manufacturing, in railroad freight charges, in wages, and in taxation charges.

EXPORT TRADE.

"The satisfactory results obtained from the export business, through the building up of a permanent and continuous export trade, as noted in previous reports, have continued. During the year there were shipped for export 1,014,082 tons of steel commodities of various kinds, a decrease of 6 per cent as compared with the shipments in the previous year. The gross receipts for the 1907 shipments, however, exceeded those for 1905 by 16 per cent. The average mill price per ton received for all exported materials was only 7½ per cent less than the average price received for all domestic shipments. The advantages to the employes, the domestic consumer, and the manufacturer, of a fair volume of foreign trade during periods of business depression in the United States, have been emphasized in previous reports. In order to obtain the maximum benefits from such trade during times of lesser activity in business in the domestic market, it seems wise to sell continuously in the neutral markets of the world and even at times when foreign trade conditions do not result in prices so near the domestic prices as were received during 1907.

PURCHASE OF TENNESSEE PROPERTY.

"In November, 1907, the Corporation acquired a majority of the common stock of the Tennessee Coal, Iron & Railroad Co. The purchase was made during the financial panic of October, 1907. The parties owning or controlling a majority of the Tennessee Co.'s stock offered the same to the Corporation on terms which were satisfactory both as to price and manner of payment. The purchase of the property promises benefit to the Corporation and also aided promptly and materially in relieving the financial stress at the time existing. The Tennessee property is very valuable. Its mineral resources are large. The location of the iron ore and coal deposits in the immediate proximity of the manufacturing plants enables the production of iron at reasonable cost. It is believed the lines of business of the Tennessee company can be materially extended. During the last two years about $6,250,000 were expended in rehabilitating, modernizing and enlarging the furnaces and steel plant. Additional expenditures of considerable mag-

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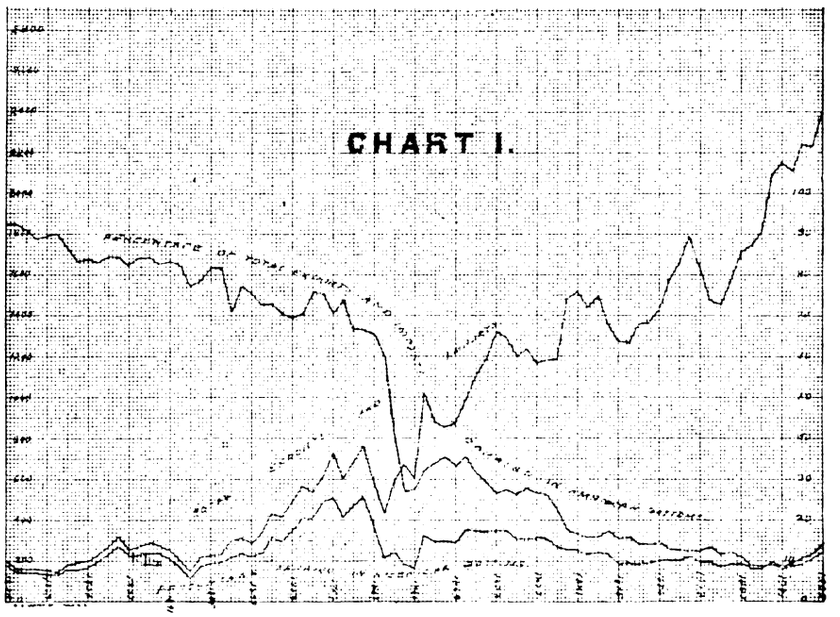
The vessels receiving such bounty to receive no other bounty, and to be at the disposal of the government (for a prescribed consideration) in case of war.

(4) Foreigners would flock to secure the superior American food and treatment, and then when the war cloouds hung over the United States go back to their own government, and leave us with our pick of vessels, but without trained citizens to man them. Therefore, we propose "naval volunteers" being required on each outward passage, and an increasing percentage of these as members and apprentices of each crew




until at least 50 per cent are such men. A "naval volunteer" being an American citizen who has had at least two years' experience at sea, is able bodied and follows the sea for a living. These "naval volunteers" also holding themselves liable to service on call by the President in time of war, and to receive from the government each year as compensation for such willingness a sum which varies from $100.00 for masters and chief engineers to $15 for boys.

THESE SCHEMES WILL COST, AND WHO WILL PAY?

There is at present a tax imposed on the tonnage of any vessel for entering (except in distress) any port the world over. This is generally limited to the first few entries each year. In the United States the money thus derived ($885,840) goes into the nation's treasury to be spent for

**TOTAL SHEET**

**OF**

## MERCHANT MARINE IMPROVEMENT ESTIMATES

| | 1st Year | 2nd Year | 3rd Year | 4th Year | 5th Year | 6th Year | 7th Year | 8th Year | 9th Year | 10th Year |
|---|---|---|---|---|---|---|---|---|---|---|
| Increase of commerce over 1905 | 10 per cent | 15 1-2 per cent | 22 1-2 per cent | 32 per cent | 43 per cent | 55 1-2 per cent | 69 per cent | 85 per cent | 102 per cent | 121 1-2 per cent |
| No. of tons added each year | 50,000 | 150,000 | 300,000 | 400,000 | 500,000 | 600,000 | 700,000 | 800,000 | 900,000 | 1,000,000 |
| Bounty paid to ship-owners | 2,000,000 | 4,500,000 | 6,000,000 | 6,000,000 | ..... | ..... | ..... | ..... | ..... | ..... |
| Mail contracts | 1,133,250 | 1,167,000 | 3,133,000 | 3,133,000 | 3,133,000 | 3,133,000 | 3,133,000 | 3,133,000 | 3,133,000 | 3,133,000 |
| Subsidy to Cargo Vessels average $1 per ton | 800,000 | 1,400,000 | 2,000,000 | 4,200,000 | 6,300,000 | 8,400,000 | 11,200,000 | 14,000,000 | 18,200,000 | 22,000,000 |
| Naval Volunteer Retainers | 150,000 | 200,000 | 400,000 | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 | 500,000 |
| Total Cost | 4,083,250 | 8,167,000 | 12,133,000 | 16,233,000 | 9,933,000 | 12,233,000 | 15,633,000 | 18,233,000 | 21,833,000 | 25,833,000 |
| Income | 2,750,000 | 2,857,500 | 3,062,500 | 3,370,000 | 3,575,000 | 3,887,500 | 4,250,000 | 4,625,000 | 5,062,500 | 5,537,500 |
| Net Cost | | | | | | | | | | |

| | | | |
|---|---|---|---|
| Total Gross Cost | $143,714,250 | | |
| Total Income | $ 34,067,500 | | |
| Total Net Cost | $109,676,750 | | |
| Average Yearly Cost | $ 10,967,675 | In round numbers | $11,000,000 |
| Population of U. S. 1900 | 85,268,941 | | |
| Estimated Average Pop. 1900 1910 | | " " " | 86,000,000 |
| Cost per Year per Individual | | " " " | $ .13 |

nitude in 1908 are contemplated to complete the plans for improvements which were under way when the Corporation acquired the property. It is believed that when these improvements and extensions shall have been completed the business of the com-

EXPENDITURES FOR IMPROVEMENTS.

"The expenditures by subsidiary companies during 1907 for additional property and construction, including the Tennessee company's expenditures for two months only, amounted to $66,981,252.46. Included in this total is $19,343,229.62 for account of the Gary plant in Indiana. The subsidiary companies also made during the year expenditures aggregating $20,324,584.90 for extraordinary replacements. The foregoing expenditures, with the exception of $2,348,301.80 financed by issue of securities and purchase obligations, have been paid for from earnings and surplus income. The properties have been maintained at the highest state of efficiency, and through liberal outlays their production and earning power have been materially increased. At the close of the year a large amount of construction and improvement work was still in progress, being principally the uncompleted portion of the program for extensions and betterments authorized in the early part of 1907. The amount unexpended, Jan. 1, 1908, for these purposes, including those for Tennessee Coal, Iron & Railroad Co., but exclusive of the requirements for the new work at Gary, Ind., referred to below, equaled approximately $40,000,000. It is estimated that about 85 per cent of this total amount can be expended in 1908.

PROGRESS AT GARY.

"Substantial progress was made during the year in the construction of the new plant at Gary, the building of the city, and in the terminal railroad work and facilities adjacent to the steel plant. The expenditures made in connection with the foregoing to Dec. 31, 1907, including the cost of about 9,000 acres of land, amounted to $24,063,388.53. This amount has been provided entirely from surplus net profits of the Corporation. Dec. 31, 1907, there was reserved in the special fund set aside and available for the foregoing construction work, a balance of $26,051,242.62. The balance unexpended, Jan. 1, 1908, on appropriations heretofore authorized for this work was $35,517,000. It is believed about $18,000,000 of this amount can be expended during 1908. The following is a brief description of the property and the status of the construction work at Gary.

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irrigation or Indian reservation or such other purposes as Congress may direct. In all fairness, incomes thus obtained should be used to aid the struggling industry under consideration, and as the tonnage dues of the United States are the lowest in the world,* as a partial offset to the expenses we advocate the advance of 10 cents per registered ton for each arrival from near by foreign ports not to exceed $1.00 per ton in any one year, and 20 cents per registered ton for each arrival from a distant foreign port, and not to exceed $2.00 per ton for any one year. These duties to be levied on any steam sailing or other vessel, American or foreign. Now let us see how this scheme would work out financially.

In 1905 there were only 92,786 gross tons built on the seaboard, and so much of this was for harbor and coastwise use, that not more than 25,000 tons were designed or even could be used for foreign trade. At $100.00 a ton this would cost $2,500,000 and 40 per cent of this is $1,000,000. As it generally takes over a year to build ships, during the first year not more than 50,000 tons would claim the bounty (or $2,000,000). During the second year probably not more than 150,000 tons would claim the bounty (or $4,500,000), the third year 300,000 tons (or $6,000,000), and the fourth 400,000 tons (or $4,000,000).†

TABLE II.

| | Service. | Maximum Compensation. |
|---|---|---|
| *From Atlantic ports of United States to—* | | |
| United Kingdom and Northern Europe | Weekly | $250,000 and present |
| | Monthly | $150,000 |
| Brazil | Fortnightly | $300,000 |
| | Fortnightly | $375,000 |
| Uruguay and Argentina | Monthly | $187,500 |
| | Monthly | $187,500 |
| South Africa | Fortnightly | $375,000 |
| *Pacific ports of United States to—* | | |
| Hawaii, Japan, China, Philippines | Monthly | $300,000 |
| | Fortnightly | $600,000 |
| Japan, China, Philippines | Monthly | $210,000 |
| | Fortnightly | $420,000 |
| Via Hawaii and Samoan Islands to Australasia | Once in 3 weeks | $217,000 and present |
| Mexico, Central America, Isthmus of Panama | Fortnightly | $120,000 |
| *Gulf ports of United States to—* | | |
| Brazil | Monthly | $137,500 |
| | Fortnightly | $275,000 |
| Cuba | Semi-Weekly | $ 75,000 |
| Central America and Isthmus of Panama | Weekly | $ 75,000 |
| Mexico | Weekly | $ 50,000 |

Tabulated from Doc. 564, 59th Congress.

The mail subventions as above specified, have been estimated by the Merchant Marine Commission, and have been carried direct to the total sheet. In the year 1905 there was a total registered tonnage of 7,080,604 tons of entrance of American vessels which entered our ports. Therefore, $500,000 is about what would have been spent, as against 6,679,173 tons of 1904, or 6 per cent increase. Allowing same rate of increase not to exceed $600,000 would have been so expended in 1906 or $700,000 during the fiscal year ending June 30th, 1907, or $800,000 in 1908, the very quickest that this proposed plan could now be put into operation. The American tonnage would increase more slowly after this, owing to the bounty to ship builders being withdrawn.

In 1904 there would have apparently been paid $922,325.48 in subsidies to cargo vessels had this plan been in operation, but as the Commissioner of Navigation points out it would have been doubtful if all vessels could have come up to the requirements, and received subsidy. These figures are based on the Commissions of Navigation report, and the results of these estimates are shown on the total sheet. The naval volunteer idea being entirely new, it is probable that not more than 3,000 men would be enrolled the first year, a total enrollment of 6,000 the second year, 8,000 the third year, and 10,000 the fourth, which will presumably exhaust the available supply of material, based on Great Britain's example. The amounts to be expended this way have been carried to the total sheet allowing an average of $50.00 per man.

Will the income be enough to warrant this expenditure? The registered tonnage entering in 1904, was 29,952,410, of which about 25,000,000 would be taxable under the provisions given above. In 1905 it was 30,983,217 tons, a gain of 3 per cent, 25,000,000 tons of which would be taxable. At an average of 10 cents a ton this would be $2,500,000, assuming that the same rate of gain (3 per cent) was maintained during 1906 and 1907, and 4 per cent during 1908 and 1½ per cent additional each year thereafter. (This has been computed and carried to the table.)

* See table 3.

† These figures are based on the Commissioner of Navigation report.

THE SITE.

"The property is located at the southern end of Lake Michigan, in Lake county, Ind., 25 miles from the business center of Chicago. The tract contains about 9,000 acres with about 10 miles frontage on the shore of Lake Michigan, and the area will ultimately be increased by filling the present submerged lands adjoining the Lake Michigan shore line. The property is located on, or immediately adjacent to, five trunk lines of railways.

THE MANUFACTURING PLANT.

"The steel plant is being constructed on an area of 1,000 acres of the above property fronting on the lake. Ground was first broken in August, 1906. The plant construction authorized to date is as follows:

"Eight 450-ton per day blast furnaces, with the necessary vessel slip, ore unloading and storing facilities, power houses, pig casting plant and other auxiliaries; fifty-six 60-ton open-hearth furnaces, estimated to produce 225,000 tons of ingots per month; rail mill, estimated to produce 100,000 tons of rails per month; billet mill, estimated to produce 100,000 tons of billets per month; 48-inch universal plate mill; 160-inch sheared plate mill; merchant mills, with a capacity of 50,000 tons per month; complete equipment of mechanical shops; office building.

"The general plans adopted provide various departments in this plant which will permit increasing the number of blast furnaces to 16, and the steel producing and rolling capacity accordingly.

PROGRESS IN CONSTRUCTION WORK.

"The progress made in the construction work to date is as follows:

"The vessel slip, which is 250 feet wide and is to extend inland 3,000 feet and from the shore line into the lake 2,000 feet, has been excavated to approximately 2,500 feet inland; the two docks forming the sides of the slip extending into the lake are well under way, the piling and sheeting having been placed for nearly the entire distance.

"The ore unloaders are erected complete, and the ore bridges and bins are in process of erection.

"The iron work on four blast furnaces is nearing completion, and the foundations for the second four are ready to receive the iron work.

"The blowing engines for the first four furnaces, comprehending eight gas-driven and two steam-driven engines, are under process of erection. The foundations have been started for the

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By an inspection of the table it will be seen that the net cost of the American citizen averages 13 cents per year. If such a plan was adopted by Congress it would cause the following beneficial results:

(1) A force of 10,000 naval volunteers valuable in case of war.

TABLE III.

| COUNTRY. | TAX. | USES OF THIS REVENUE. |
|---|---|---|
| Britain | 32c per ton for steam; 27c per ton for sail. | Forms part of the subsidy moneys. |
| Hamburg, Bremen | about 8c per ton an arrival. | |
| France | 20c per ton per arrival. | Produces more than enough to pay all the construction and navigation bounties. |
| Italy | 27c a ton on each arrival | Ditto. |
| Spain | 48¼c per ton weight unloaded. | Ditto. |
| Norway | 35c per ton of cargo. | Ditto. |
| Austria | 16c on first and second, 12c on third and fourth, and 8c thereafter. | |
| United States | 3c per net ton from near port not to exceed 15c per ton per year, and 6c per ton from dist., not to exceed 30c per net ton per year. | General funds. |

(2) A new fleet of from 200,000 to 300,000 tons of steel mail steamships and a naval reserve needed by the country, as shown by the report of Admiral Dewey.

(3) A net addition to our cargo and fishery tonnage of 5,300,000 tons, increasing fourfold the actual ocean shipping of the United States, and enabling us to carry not 10 per cent but 30 per cent or 40 per cent of our own exports and imports.

(4) The creation of 10 regular new or strengthened steamship lines, creating new outlets for American products.

The burden of this will be borne in a large part by the foreign ships which have disintegrated and now monopolize the AMERICAN MERCHANT MARINE.

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blowing engines for the second four furnaces.

"The electric power plant, which is to furnish power for driving all of the mills in the plant; also for pumping water and for lighting the city of Gary, includes a power house 969 feet long by 107 feet wide, one-half of which is now erected, together with the foundations for nine gas engines and two steam turbines. The foundations for the remainder of the building and machinery are well under way. There will be installed in this plant in all seventeen 3,000-horsepower gas-driven generators and two 2,500-horsepower steam turbine-driven generators. It is believed this is the largest installation in one unit of gas engines that has ever been made.

"In the steel producing department, one open-hearth unit, consisting of fourteen 60-ton furnaces, with hot metal mixer and other auxiliaries, is nearing completion, and the foundations for the second similar unit are completed and erection of the steel work has been started.

"On the rail mill the foundations and the building are nearing completion, and the erection of the machinery is well advanced.

"On the billet mill a part of the excavation and foundation work has been completed. Seventy-five per cent of the machinery for this mill has been contracted for and is now being constructed.

"For the plate mills and merchant mills the plans have been completed.

"The shop equipment, including machine shop, boiler shop, foundry, blacksmith shop, carpenter and pattern shop, pattern storage shop, roll shop and general store building, is practically completed and in operation.

"The office building has been completed.

THE CITY OF GARY.

"Approximately 800 acres of the property acquired, lying immediately south of the mill site and separated from it by the Grand Calumet river, has been platted into about 4,000 lots and incorporated as the first subdivision of the city of Gary. This subdivision will contain more than 25 miles of paved and macadamized streets. To date 25,250 lineal feet of streets have been paved, and 37,000 lineal feet of sidewalks laid.

"A sewer system consisting of a discharge main of 96 inches in diameter, with lateral branches 60 inches, 54 inches and 36 inches respectively in diameter, has been installed, having a total length of 97,000 lineal feet. Ninety-one thousand lineal feet of water pipe have been laid in the first subdivision and temporary pumps installed, which are now furnishing the water supply from driven wells. There is under construction a permanent water works pumping station which contemplates the construction of a water tunnel 72 inches in diameter, 15,000 feet long, extending into the lake 7,000 feet from the present shore line.

"A gas plant, with a capacity of 300,000 cubic feet of water gas per day, is completed and in operation. Seventy-one thousand lineal feet of gas pipe have been laid in the first subdivision. An electric lighting plant, furnishing both incandescent and arc lights, has been installed and is in operation, current being furnished temporarily from lines connecting with the Illinois Steel Co.'s electric generating plant at South Chicago.

"Approximately 500 dwelling houses have been erected. Many of these houses are now occupied. In addition to the dwelling houses, the following public buildings have been erected and are now occupied: One hotel building, containing 40 rooms; one restaurant; two lodging houses; school house containing nine rooms.

"All of the above development and construction work in the city of Gary has been carried on by the Gary Land Co., a subsidiary company of this corporation.

"Residence and business lots have been offered for sale, with the requirement that buildings of an approved character be erected thereon within 18 months after purchase. Under this plan approximately 240 lots have been sold, largely in business districts. On the principal business street in the first subdivision there have been constructed by purchasers of lots about 40 business blocks, the estimated cost of which is $600,000 or more. Most of these buildings have been completed and are now occupied by stores of various kinds, two banks and offices.

TERMINAL RAILROAD WORK.

"The main lines of the Baltimore & Ohio Railroad Co. and the Indiana Harbor Railroad Co. ran directly through the manufacturing mill site. In order to remove these lines of railroad from the mill site and to permit the construction of a sufficiently large and properly located railroad yard for use in connection with the steel plant, an agreement was entered into by the various railway companies concerned whereby the main lines of the Baltimore & Ohio Railroad Co. and the Indiana Harbor Railroad Co. were changed so as to run south of the mill site. This changing of the main lines of the companies named also involved a change in the main line of the Lake Shore & Michigan Southern Railway Co. and the construction of a new line

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of railway from a connection with the Indiana Harbor railroad east of the mill site, southwestwardly and westerly passing to the south of the city of Gary, to the town of Gibson, where a connection is again made with the Indiana Harbor railroad.

"A great deal of clearing, grading and filling, and track laying has been done in connection with the foregoing rearrangement and construction of railroad lines. Upon the completion of the work an adjustment of the expenditure is to be made between all of the companies interested.

"Within the steel plant of the Indiana Steel Co., 41.6 miles of standard gage yard tracks have been laid. Outside of and adjacent to the steel plant to the westward the large railroad yard known as Kirk yard is under construction by a subsidiary company. In this work approximately 21 miles of tracks have already been laid and additional grading done to take care of necessary additional tracks for some time to come. At the eastern end of this yard substantial progress has been made in the construction of a large roundhouse, coal chutes and power house.

DULUTH STEEL PLANT.

"There has been purchased a site containing about 1,580 acres (of which 300 acres are now submerged) located in St. Louis county, Minn., 10 miles from the center of the city of Duluth, on which it is proposed to construct a moderate-sized iron and steel plant. The tract fronts on the St. Louis river, which is navigable for large lake steamers, and is located on the line of the Northern Pacific railway. It is expected, however, that there will be constructed in connection with the steel plant a belt railway extending northwardly therefrom to a connection with the Duluth, Missabe & Northern railway to enable the prompt and economical delivery of ore to the plant from the Minnesota ore ranges; also eastwardly from the steel plant across the St. Louis river into Superior, Wis., where connections will be made with five trunk lines of railways reaching the head of Lake Superior from the south and west. It is proposed to have the plant constructed by the Minnesota Steel Co., a subsidiary corporation. The plans for the scope and construction of the steel plant have not yet been fully developed. The expenditures on account of this property during 1907 include the purchase of the real estate and some clearing and leveling of the site.

## HARTWELL LAUNCHED.

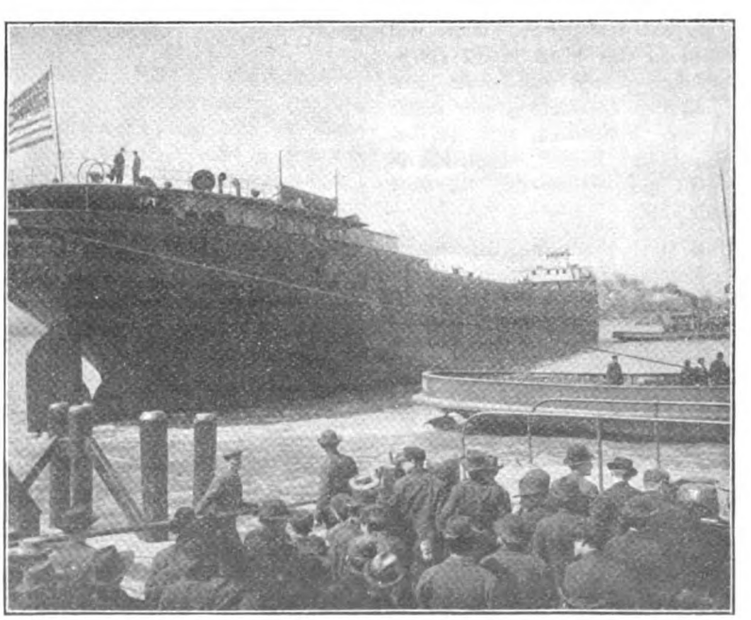
The launching of the bulk freighter Fred G. Hartwell at the yard of the Toledo Ship Building Co. on Saturday last was a gala day for Toledo.

MISS RUTH HARTWELL.

It was the first time that a general invitation had been extended to attend a launching at this yard since it was taken over by the Toledo Ship Building Co. two years ago. In the interim the yard has been literally transformed, making it one of the most compact, convenient and accessible yards on the lakes. The practical ship yard men present did not fail to note this, many complimentary things being said of Charles B. Calder, the general manager, under whose supervision the yard has been remodeled. Invitations were accepted generally by men prominent in ship building and ship owning, Antonio C. Pessano, representing the Great Lakes Engineering Works and M. E. Farr and Frank E. Jeffrey representing the Detroit Ship Building Co. James C. Wallace, president of the American Ship Building Co., wrote a letter expressing his regret at his inability to be present, and Robert Logan was unavoidably absent at Bay City.

The new steamer is named in honor of the president of the Berwind-White Coal Co. and one of the leading figures in the coal industry of the United States. The new steamer was christened by his daughter Ruth, who broke the traditional bottle of champagne as the boat went overboard nine minutes ahead of time. The steamer was launched into the new dry dock No. 2. The great concrete portal of this dock affords a natural elevation, thousands witnessing the launch from this point of vantage. The day itself was an ideal one for the purpose. As soon as the Hartwell was in the water tugs towed her to the shear legs where her boilers were lying ready to be hoisted aboard. The launching party then inspected the John Dunn Jr., a duplicate of the Hartwell, lying in the slips.

The Hartwell is 524 ft. over all, 504 ft. keel, 58 ft. beam and 30 ft. deep, having quadruple-expansion engines, 20, 29, 42 and 61-in. cylinder diameters by 42-in. stroke, supplied with steam from three Scotch boilers, 12 ft. 6 in. by 11 ft. 10¼ in., equipped with force



TOWING THE HARTWELL TO THE SHEAR LEGS.

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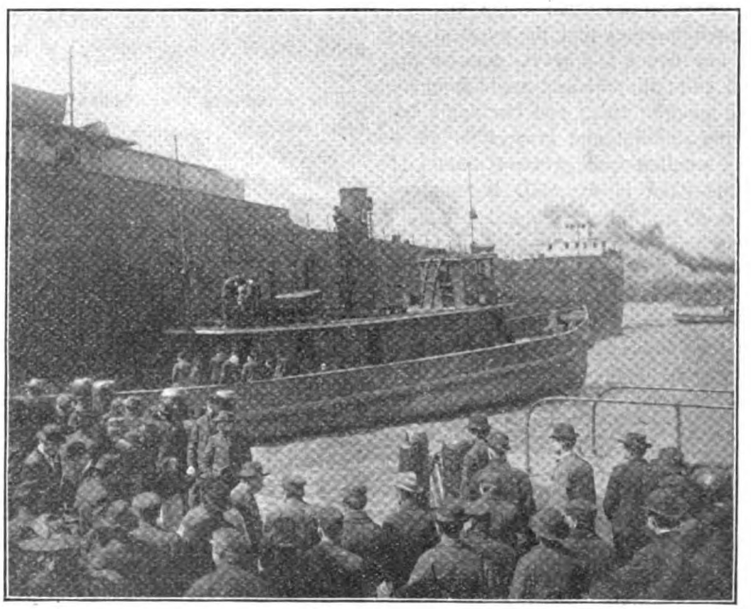
draft and allowed 210 lbs. pressure. The Hartwell is built on the girder system with side tanks, and her hatches, 15 in number, are spaced 24 ft. centers and are 12 ft. wide fore and aft. She will carry about 9,500 tons of ore.

At the conclusion of the launch, luncheon was served at the Toledo Club, the decorations being daffodils. H. I. Shepherd was master of ceremonies and introduced James E. Davidson, of Bay City, as toastmaster in a very graceful speech. In accepting the chair Mr. Davidson said that he



TOWING THE HARTWELL TO THE SHEAR LEGS.

was by no means the first person chosen as toastmaster. The post had first been offered to Harvey D. Goulder, Wm. Livingstone and Harry Coulby, but all three had pressing engagements elsewhere and so Mr. Tomlinson had said, "Well, it's up to you, Jim." Mr. Davidson said that it was proper that ceremony should attend the launching of a ship, because it represents a financial investment of no mean proportion and is moreover a component part of one of the world's greatest industries. He felt proud of the ship and of the Toledo Ship Building Co., and then introduced Mr. Tomlinson, whom he declared had "the distinction of being the first white child born in Duluth."

Mr. Tomlinson's remarks were extremely felicitous. He regretted his inability to say anything pleasant regarding the Toledo Ship Building Co., owing to the presence of Mr. Pessano and Mr. Farr, both of whom had built ships for him and to whom he still owes large sums of money, and he felt in no mood to antagonize any of these interests by saying anything pleasant of a rival. He felt perfectly safe, however, in complimenting the sponsor highly for her part in the affair, the perfection of which was probably due to practice.

Fred G. Hartwell responded briefly to a toast, complimenting the Toledo Ship Building Co. upon the construction of the vessel and expressing his appreciation of the honor which Mr. Tomlinson had conferred upon him.

J. H. Jones, of Chicago, said that if the Hartwell emulated the example of industry of Mr. Hartwell it would have to work 30 hours a day.

Mr. Davidson in introducing Brand Whitlock, mayor of Toledo, said that no man is so much interested in any community as the man who owns property in it. He advised the people to go out to the ship yard and familiarize themselves personally with the magnitude of the plant. He held that politics should be entirely eliminated from municipal elections and felt that the people of Toledo were following that practice.

Mayor Whitlock, in responding, said it was his custom, especially at election times, to visit the ship yards. He felt that he was voicing the sentiment of the entire city in saying that the people of Toledo were proud of the Toledo ship yard and that as a token of their appreciation they intended to give the Toledo Ship Building Co. an order for a fire tug in the near future. This sentiment was liberally applauded by Mr. Shepherd.

Antonio C. Pessano, president and general manager of the Great Lakes Engineering Works, said that the problem of transportation was the great American problem and that it was being solved on the lakes better than anywhere else. He congratulated the Toledo Ship Building Co. upon constructing such a ship as the F. G. Hartwell, and bearing such a name, he felt like sharing in their pride.

John Craig referred to the pleasure which he himself had taken in visiting the yard and witnessing the launching. To a ship builder a launching is an anxious moment because the ship is subjected to a strain greater than any she will ever meet with in common practice, and every ship builder breathes easier when it is over with. He held the new ship to be a credit to any yard.

George Marcy, in responding to a toast, said that he knew Mr. Hartwell very well, but that he also knew his wife and daughter, and if he was naming the ship he would name her F. G. Hartwell's Family.

Brief speeches were made by Mr. J. W. Mauck, J. P. Ryan and Dr. Tanner.

Those present at the launching were:

Miss Ruth Hartwell, Fred G. Hartwell, L. A. Wiley, W. D. McGregory, E. J. E. Ward, John H. Jones, George E. Marcey from Chicago; B. S. Hamill from Pittsburg; James E. Davidson and C. R. Wells from Bay City; J. W. Mauck from Hillsdale, Mich.; W. C. Richardson, Burton Ayers, John R. Scott, Douglass Brews, H. N. Herriman, E. P. Lenihan from Cleveland; Frank T. Goodwin from Painesville, O.; B. W. Parker, John Walsh, John I. Webster, M. E. Farr, Frank B. Jeffries, J. D. Webster, Antonio C. Pessano from Detroit; H. P. Broughton, G. A. Tomlinson from Duluth; Thomas Fisher from Philadelphia; John Craig, George L. Craig, Hon. Brand Whitlock, W. C. Brainard, R. A. Bartley, J. E. Ryan, H. L. Thompson, S. O. Richardson, A. A. Moody, A. M. Donovan, S. C. Schenck, David Robison Jr., E. H. Cady, H. R. Klausner, W. F. Elrod, J. F. Youse, E. C. Law, and O. B. Crane from Toledo.

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The bulk freighter Alexis W. Thompson was launched from the Bay City yard of the American Ship Building Co. for W. H. Becker, of Cleveland, and was christened by Mrs. Davis P. Thompson, of Chicago. Quite a delegation went from Cleveland to attend the launching, including W. H. Becker, Capt. John Bartow, Lee M. Curdy, O. P. Hannan, John Donaldson, Mr. and Mrs. P. H. Lonergan, C. A. Becker, Guy Seigrist, Charles Williams, Mr. and Mrs. Walton Monroe, Capt. Wm. Hill, James Nacey, Charles

(Continued on page 21.)

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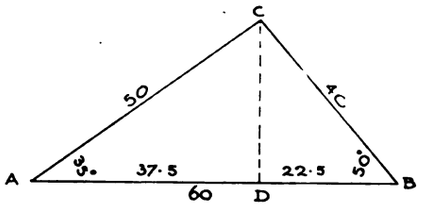
## TO FIND THE LENGTH OF THE ALTITUDE.

The altitude of either a scalene or isosceles triangle is found as follows: In any plane triangle, if a line is drawn from the vertical angle perpendicular to the base (this line is the altitude), then the whole base will be to the sum of the other two sides as the difference of those sides is to the difference of the segments of the base.

Let ABC be a triangle, and CD perpendicular to the base; then will AB : AC + BC :: AC — BC : AD — DB.




AC (50) + BC (40) = 90; AC (50) — BC (40) = 10: AD — BD, or, 60 : 90 :: 10 : AD — BD.

Hence, AD — BD = 90 × 10 ÷ 60 = 15; then, AD = ½ (60 + 15) = 37.5 and BD = ½ (60 — 15) = 22.5.

CD, or altitude, can now be found by square root, as already explained.

In being able to determine the altitude as above it is possible to solve the sides of all oblique triangles without recourse to trigonometry, or the logarithmic tables. This is of great convenience and importance, since it is possible for the ordinary student of arithmetic to be able to handle and understand a difficult part of mathematics. A thorough understanding of these principles will lead the student to an insight of the higher mathematics.

### ON PARALLELOGRAMS.

The opposite angles of any parallelogram are equal; and the sum of the four angles are exactly equal to 360°. If we know one of the angles we can easily find the other three, since opposite angles are equal. If the angle at A, Fig. 1, is 60°, angle B will also equal 60°; 60 and 60 = 120, and 120 from 360 = 240; hence, the angles B and D equals 240, and since they are equal, one-half of 240 must equal each angle.

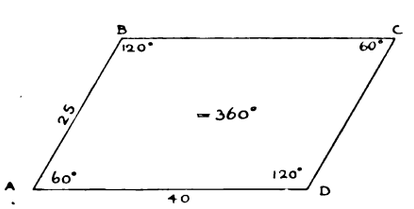



FIG. 1.

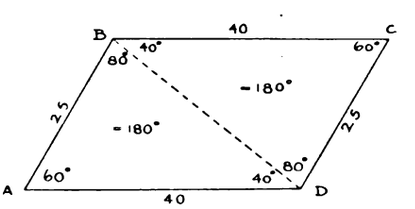
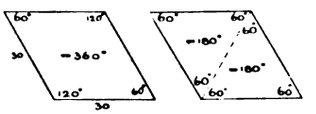



FIG. 2.

THE RHOMBOID.

BAD, Fig. 2, is exactly the counterpart of the angle DCB. A rhomboid is a parallelogram whose angles are oblique. The diagonal through it makes two scalene triangles of it.




THE RHOMBUS.

A rhombus is an equilateral rhomboid; in other words, the diagonal will make two equilateral triangles, the sides and angles of which are equal to one another.

Note.—Remember that the greatest angle of any figure is always opposite the greatest side; the smallest angle is opposite the smallest side; and the angle between the smallest and greatest is opposite the smallest and greatest sides. If the angle BDA is 40, ABD is equal to 80, since 40 and 60 are 100 and 100 from 360 equals 80.

The altitude of any triangle divides the triangle into two right-angled triangles; it divides an isosceles and equilateral triangles into two equal right-angled triangles, and the scalene triangle into two unequal triangles. The accompanying Figs. 1 and 2 are equilateral triangles; the three angles being equal their opposite sides are equal. The sum of the angles of every triangle equals 180°. The altitude drawn to an equilateral triangle (Fig. 2) makes two equal right-angled triangles of it. The altitude divides the angle at the apex into half, as A, in Fig. 2. It is because of the altitude meeting the base at right angles that makes the right-angled triangle; the angle on either side of it being 90°.

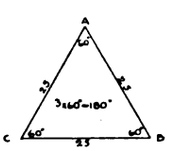



FIG. 1.

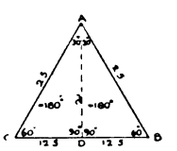



FIG. 2.

EQUILATERAL TRIANGLES.

The area of Fig. 1 equals 262.5, being 25 on a side, the altitude being 21; hence, 25 × 21 ÷ 2 = 262.5. Half of this area is 131.25; half of Fig. 2 is equal to a base of 12.5, a perpendicular of 21 and a hypotenuse of 25; hence, 21 × 12.5 ÷ 2 = 131.25.

We know that the angle at A (Fig. 2) must be 30, since it was 60 in the first place; or, if we did not know that the altitude divided it in half, we could tell from the other angles: 90 and 60 is 150 and 150 from 180 is 30.

The altitude of an equilateral triangle may be found by square root: Square one of its sides; square half the base; subtract and extract the square root of the remainder. Example: The square of 25 is 625 and the square of 12.5 is 156.25, and this from 625 is 467.75; the square root of 467.75 is 21.62, and not 21 as given above. It was called 21 to make it even.

The foregoing also applies to the isosceles triangle.

To find the two angles at the apex of a scalene triangle after the altitude has been drawn: The angle at the base of altitude will always be 90; the angle opposite the altitude is always known; therefore, add the two and subtract the sum from 180; subtract this from the angle at the apex in the first place will give you the second angle. Example: A in Fig. 3 is 92; the angle at D made by drawing the altitude is 90 and the angle opposite altitude is 50; 90 and 50 is 140 and 140 from 180 is 40; 40 from 92 is 52, the other angle.

Knowing two sides of oblique triangles and their altitudes, the other side can be found by square root.

All angles except right angles are called oblique angles.

## QUESTIONS AND ANSWERS.

How many degrees are there in the three angles of any triangle? Ans. 180°

Two angles of a triangle measure 36° and 65° respectively. How many degrees in the third angle? Ans. 79°.

Draw a triangle containing two angles of 50° and 70°, respectively. How many degrees does the third angle contain? Ans. 60°.

Measure each side, and mark on the side its length.

Opposite which angle is found the longest side? Ans. Opposite the angle of 70°. Opposite which angle will be found the shortest side? Opposite the angle 50° since it is the smallest angle.

Draw a triangle having two angles of 75° each. Are any two of its sides equal? Ans. The two sides opposite the angles 75° are equal.

If a triangle has two of its sides equal, what is true of its angles? Ans. Two of its angles will also be equal and they will be opposite the equal sides of the triangle.

If a triangle has three of its sides equal, what is true of its angles? Ans. Its

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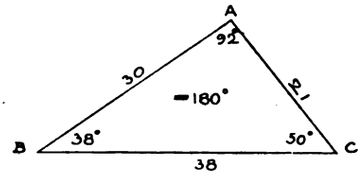



FIG. 3.

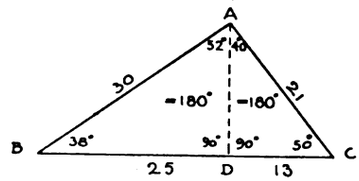



FIG. 4.

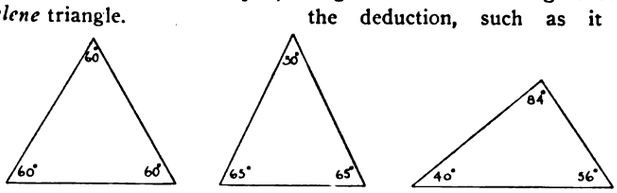
SCALENE TRIANGLES.

angles will likewise be equal. In this case each angle would equal 60°.

A triangle having all its sides equal, is called an *equilateral* triangle.

A triangle having two equal sides, is called an *isosceles* triangle.

A triangle having all its sides unequal, is called a *scalene* triangle.




EQUILATERAL. ISOSCELES. SCALENE.

## THE REGISTERED TON-VESSEL TON.

To the question: What is the best and simplest way or rule to measure a boat to ascertain her tonnage, and how much off for net, and why do they deduct for net tonnage when a boat always carries more than either her gross or net tonnage?

Multiply the length between the perpendiculars by the external breadth, this again by the depth of hold, then multiply by one of the following decimals: For yachts under 60 tons, 0.5; if over, 0.45. For full built craft, 0.7; medium, 0.66; if sharp, 0.62. High speed steamer, 0.58. Then divide by 100. This will give the approximate tonnage under deck. The mathematical formula may be given thus:

$$\frac{L \times B \times D}{100} \times \frac{6}{10}$$

for gross tonnage. The foregoing is not the custom house method, but is more from a practical standpoint, as also is this rule for yacht measurement, measure from the fore part of the stem to the after part of the sternpost. From the length deduct the extreme breadth, the remainder is this length for tonnage. Then multiply the tonnage length by the breadth, and the product by half the extreme breadth and divide the result by 0.94, the quotient will be the tonnage. The register tonnage of every vessel is her entire internal cubic capacity in tons of 100 cu. ft. each. The gross tonnage of a steamer is her total measurement under deck (including engine room, etc.), and of erections on deck; the net register tonnage is the gross register less engine room space and other minor spaces allowed by the law; the under deck tonnage is the total tonnage under deck, including engine room and all other spaces that are under deck. In the case of sailing ships there is a comparatively small difference between the gross and net register, seeing that there is no large deduction for engine room space, the deduction, such as it is, being only for crew space, fixed water tanks, chain lockers, etc. To ascertain approximately the dead weight in tons a ship can carry safely, multiply the tonnage under deck by 1.5, add 10 per cent for smooth water trips. In measurement, cargo at 40 cu. ft. to the ton, multiply the net register tons by 1.9, the product will be the approximate dead weight required.

Tonnage.—The carrying capacity of a vessel. It is actually equivalent to the difference between the weight of the water displaced by the vessel when light, and that displaced by her when loaded to the greatest safe depth of immersion. Different rules for calculating the tonnage have been legally established in different countries, some of which have frequently given results, varying widely from the true amount which might safely be carried. In deep, full-built ships the actual capacity was always largely in excess of the government-registered tonnage. The ton measurement upon which freight is charged is calculated at 40 cu. ft.; the difference between that and the ton of 100 cu. ft., or that of the register, represents the dead weight or displacement of the ship when light, or 60 per cent of the whole, 40 per cent only being available flotative power for cargo. By the old law it was provided that from the extreme length of the vessel there should be deducted three-fifths of the breadth; remainder was multiplied by the breadth, and the product by the depth, which, in the case of a double-decked vessel, was arbitrarily assumed as being equal to one-half the breadth; the latter product was then divided by 95, and the quotient was taken as the legal tonnage on which tonnage dues were to be paid. It was thus made the interest of owners to build excessively deep ships, the law in this way discriminating in favor of clumsy, slow, and inefficient ships, and discouraging attempts at improvements of model. Under the system which is at present used vessels are, for the purpose of ascertaining their tonnage, divided as follows: Not exceeding 50 ft. in length into 4 parts; 120 ft. into 6 parts; 180 ft. into 8 parts; 225 ft. into 10 parts; and over 225 ft. into 12 parts. In a steam vessel the length, breadth, and height of the engine room are multiplied together, the product divided by 100, and the result deducted from the gross tonnage. The space occupied by a propeller shaft is considered as a part of the engine room. The actual depths between decks are measured and taken as factors, and any closed-in space on or above the upper deck, and capable of receiving cargo, etc., is included in the measurement. The dimensions are all taken in feet and decimals of a foot, and the number 100 is used as a final division for ascertaining the capacity of the ship in tons.

EXAMPLE.

A ship, full built, having a length between perpendiculars, of 200 ft., 40 ft. beam and 12 ft. depth of hold, is of how many gross tons?

$$\frac{200 \times 40 \times 12 \times 0.7}{100} = 672 \text{ gross tons.}$$

Engine and boiler room space equals 35 ft. length, 30 ft. beam and 10 ft. depth

$$= \frac{35 \times 30 \times 10}{100} = 105 \text{ tons.}$$

672 = gross tons.
105 = deduction.

567 = net tons.

This ship has a cargo capacity of 567 tons, of 100 cu. ft. to the ton, or 56,700 cu. ft.; figuring 40 cu. ft. to the ton would be equal to a cargo space of 1,417.5 tons. This, however, does not represent the amount of cargo the vessel can carry, but the space available for cargo, such as bulky cargo. This vessel would carry approximately, 1,100 tons, such as coal, etc., figuring 40 cu. ft.

This vessel when light, draws, say, 11 ft. aft and 1 ft. forward, or the mean draught is 6 ft. Then, that portion of the hull immersed must be equal to 200 ft. × 40 ft. × 6 ft. × 0.8 = 38,400 cu. ft. of the whole volume of 67,200 cu. ft.

Note.—We multiply by 0.8, which is the same thing as 20 per cent off, for round of bottom, bilge, and pointed stem, etc.

A cubic foot of water weighs 62.5 lbs., therefore, a ton of water is equal to 2,000 lbs. ÷ 62.5 = 32 cu. ft. Hence, 38,400 ÷ 32 = 1,200 tons displacement; also, equals weight of ship.

Sixty per cent of 672 is practically 384

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(within 19 tons), bearing out the statement already made.

Note.—To multiply by 0.45, as in the foregoing, is the same thing as deducting 55 per cent; 0.70 is 30 per cent under the same conditions; 0.66 is 44 per cent; 0.62 is 46 per cent and 0.58 is 42 per cent.

DIFFERENCE OF DRAUGHT IN SALT WATER AND FRESH WATER.

To find the difference of immersion or draught in salt and fresh water. If from salt to fresh, multiply the draught of salt water by 36 and divide the product by 35. If from fresh to salt, multiply the draught of fresh water by 35 and divide the product by 36.

Example.—Required the draught of a vessel in fresh water when drawing 20 ft. in salt water: 20 ft. × 36 = 720 ÷ 35 = 20 5-7 in.

Table of draughts worked out by the above formula:

| ——Fresh to Salt—— | | ——Salt to Fresh—— | |
|---|---|---|---|
| Water Mark in Fresh | Would Draw in Salt | Water Mark in Salt | Would Draw in Fresh |
| Ft. | Ft. In. | Ft. | Ft. In. |
| 24 | 23 4 | 24 | 24 8¼ |
| 22 | 21 4⅝ | 22 | 22 7½ |
| 20 | 19 5⅜ | 20 | 20 6¾ |
| 18 | 17 6 | 18 | 18 6⅛ |
| 16 | 15 6⅝ | 16 | 16 5½ |
| 14 | 13 7⅜ | 14 | 14 4¾ |
| 12 | 11 8 | 12 | 12 4⅛ |
| 10 | 9 8⅝ | 10 | 10 3⅜ |
| 8 | 7 9⅜ | 8 | 8 2¾ |
| 6 | 5 10 | 6 | 6 2⅛ |

For all practical purposes it may be taken that a vessel proceeding from river water into sea water, rises ¼ in. for each foot of her mean draught.

The mean specific gravity of sea water is assumed to be 1.03; therefore, a cubic foot of salt water weighs 62.42 × 1.03 = 64.20 lbs.; hence, a cubic foot of sea water has 1.87 lbs. more buoyancy than a cubic foot of fresh water.

Here is another simple rule, and an accurate one: From salt water to fresh water multiply the draught by 1.03, and from fresh water to salt water by 0.97 (the counterpart of 0.03). Example.—24 ft. draught in salt water, how much in fresh water? 24 × 1.03 = 24.72 ft. = 24 ft. 8 2-5 in. Ans.

Twenty-foot draught in fresh water, how much in salt water? 20 × 0.97 = 19.4 = 19 ft. 4 4-5 in.

## ATLANTIC COAST GOSSIP.

Office of the MARINE REVIEW,
Room 1005, No. 90 West St.,
New York City.

During the month of March there arrived at the port of New York from home and foreign ports 723 vessels of all classes. Of these 334 were from foreign and 389 from home ports.

Congress is urged to pass a law authorizing the secretary of commerce and labor to establish anchorage buoys in New York harbor in a communication forwarded by that official to the house. The supervisor of anchorages at New York in 1907 reported that the rules and regulations governing anchorages in the harbor could not be properly enforced unless there is something to define the boundaries of an anchorage.

The North German Lloyd liner Kaiser Wilhelm der Grosse, which was disabled in mid-ocean through the loss of her rudder last October and was steered by her engines for the remainder of the voyage, has once more taken her place in the Atlantic ferry service. She has been in the hands of ship builders since the accident, and in addition to having her stern rebuilt has undergone some alterations. The great dome over the dining saloon has been removed, a ladies' room and lounge having been added on the deck above. Eight new state rooms have also been added amidships, and the long tables in the saloon have been replaced by small ones.

Capt. John Roberts, of the British steamer Benedick, from Huelva, was held in $2,500 bail by the United States Commissioner at Philadelphia, on April 2, charged with smuggling wines into this country. The steward and cook were also held in $1,800 and $500, respectively.

Postage stamps valued at over $100,000 were washed ashore from the wreck of the steamer Silvia on the island of Cuttyhunk last week. They were shipped by the American Bank Note Co. to the Newfoundland government and were in a single box.

The steamship Roma, which formerly carried oil from Texas to Marcus Hook and Philadelphia, arrived at Port Hartford, Cal., on March 31, to engage in the California oil trade.

The barge Ashland, from Philadelphia, loaded with 1,513 tons of coal for Bath, Me., and owned by the Reading company, ran ashore last week while being towed up the Kennebec river to Bath, and sank. The Ashland was built at Noank, Conn., in 1898, and her gross tonnage is 838.

In a suit for $70,000 for the loss of the brigantine Olive Francis, in a collision with the United States gunboat Winooski, 42 years ago, Judge Hale, of the United States district court of Maine, rendered a verdict against the government. The case was before congress many years and a special act was finally passed giving the right to test the responsibility in the courts. Judge Hale ruled that the gunboat's immoderate speed was the cause of the collision and that the brig was without fault. An assessor will be appointed to report the amount of the damage. The Olive Francis was lost 40 miles off the coast of Nova Scotia.

The British steamship Iran, from Cardiff, is loading 220,000 cases of refined petroleum at Philadelphia for the far east. The Iran is a twin-screw steamer of over 6,000 tons, and the cargo will be the second largest of its kind ever shipped from the United States.

The French line has issued a circular giving new rules adopted by the company to conform with the orders of the secretary of commerce and labor of the United States as to immigrants. All the booking agents and agencies are now required to make searching inquiries as to the intended passenger's antecedents and refuse passage to any not coming up to the required standards. The rule is rigidly enforced where intended passengers are from southern Italy, and the result of this policy so far shows but 1 per cent of the steerage passengers arriving by the French line has been prohibited from landing as being undesirable.

The ferry boat Union, operating between Catherine street slip and Main street, Brooklyn, caught fire and sunk in the New York slip last week. An alarm was sent in when the fire was discovered, three engine companies and the fire boat William F. Strong responding. After an hour's ineffectual fighting the captain ordered the sea cocks opened, the Union sinking in 11 ft. of water. The damage is estimated at $45,000.

The Norwegian steamer Brighton, from Jamaica, arrived at Baltimore recently and was the first fruit steamer to discharge cargo at the new piers. The Brighton is chartered to the Lanasa & Goffe Importing & Steamship Co., who have a line of steamers running between Baltimore and Port Maria, Jamaica, and the space used by the Brighton has been allotted that firm for the discharging of tropical fruits.

There are rumors of a projected direct steamship line between Boston and Havana, with St. John, N. B., as a port of call.

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## BOOK REVIEWS.

**"Marine Boiler Management and Construction"** is a treatise on boiler troubles and repairs by C. E. Stromeyer, chief engineer of the Manchester Steam Users' Association and formerly engineer surveyor to Lloyds Register. The return tubular boiler has established itself so firmly for marine purposes and its construction and working have for many years been so well understood, that a few additions could be made under these heads, but metallurgical investigations are making considerable progress and a better understanding of steel is now possible than used to be the case. Some additions have been made to the chapter on Materials, including a few remarks on the microstructure of steel. This very interesting study, however, is not sufficiently advanced for practical purposes. Another subject which has been revised is gas analysis. The analysis of the waste gases is at present the only direct method of ascertaining whether the furnaces are being fired economically or not. Ashore great benefit and improved economy has resulted from the employment of recorders of waste gas compositions. Some of these appliances are perfectly suitable for use at sea and seeing that the coal bill of the small steamer is often larger than that of large factories, considerable advantage might be expected from the control of the firing conditions. The latest alterations in the rules of the board of trade and of Lloyds Register have been embodied in this edition.

Lieut. H. C. Dinger has placed into book form the series of articles on the "Care and Operation of Naval Machinery" as they appeared in the Journal of Society of Naval Engineers. These articles are extremely valuable as the information contained in them has been derived from personal experience and is not usually to be found in the standard treatises on marine engineering. The book, which is hand-book size, was published by the D. Van Nostrand Co. and can be supplied to the trade by the MARINE REVIEW. The price is $2 net.

Thomas Walton, author of "Steel Ships—Their Construction and Maintenance," has written a new book entitled "Present-Day Ship Building." This book is really a revision and enlargement of Chapters 3, 4, 6 and 7 of "Steel Ships" and is intended as a manual for students and ships' officers for their respective examinations, ship superintendents, surveyors, engineers, ship owners and ship builders. While the external ap-

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**"Steam Turbines"** by Carl C. Thomas, professor of marine engineering, Sibley college, Cornell university, is now in its third edition. In the third edition Prof. Thomas calls attention to the new problems in the design of the Curtis and Parsons types of turbine, to the suggestions regarding turbine analysis and to the diagram of heat contents of steam, the superheated region of which is plotted from the results of the author's recent investigation of the specific heat of superheated steam. The third edition also contains new matter relating to the application of steam turbines to marine propulsion, including illustrations of some of the more recent turbine steamers.

## TRADE NOTES.

The De Laval Steam Turbine Co., Trenton, N. J., has issued Bulletin 501, descriptive of their steam turbine machinery, including dynamos, turbine motors, turbine pumps and blower.

The Stow Flexible Shaft Co., Philadelphia, Pa., recently put out a catalog descriptive of their portable tools and machinery, including flexible shafts, portable motors, drills, grinders and polishers.

The Falls Hollow Staybolt Co., Cuyahoga Falls, O., has issued in pamphlet form the article entitled "Staybolts—Their Use and Abuse" as written by John Hickey, of Salt Lake City. The pamphlet, which is very nicely printed, will be sent to anyone upon request.

Wm. W. Nugent & Co., 18-30 West Randolph street, Chicago, have recently issued a catalog descriptive of Nugent's oiling devices. The catalog contains Mr. Nugent's very interesting and well-known article entitled "How to Oil an Engine." The text is quite complete in description of the various oiling devices manufactured by this company. The line drawings are numerous and clear.

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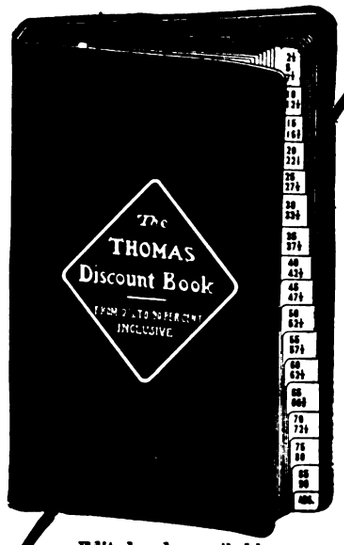


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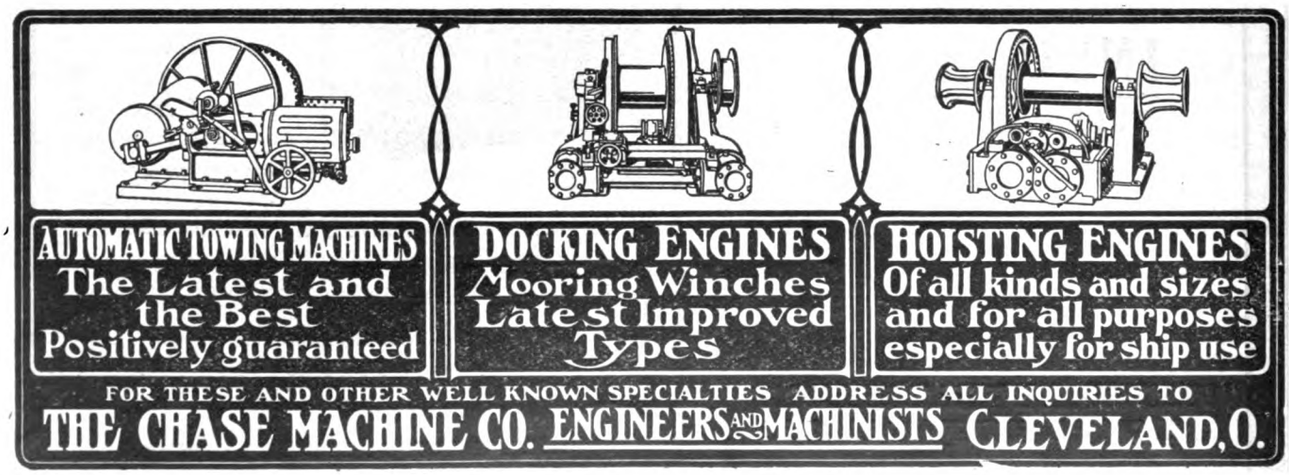

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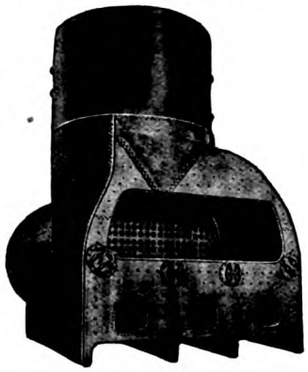

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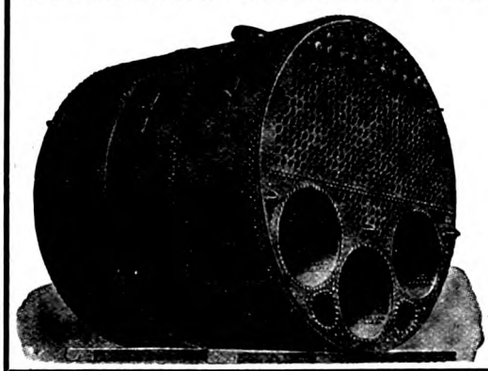

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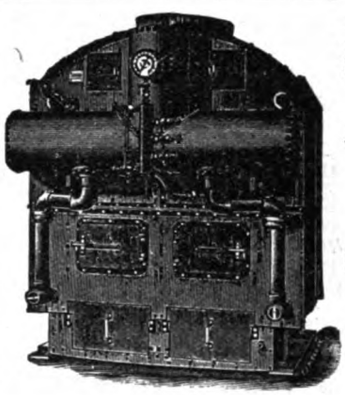

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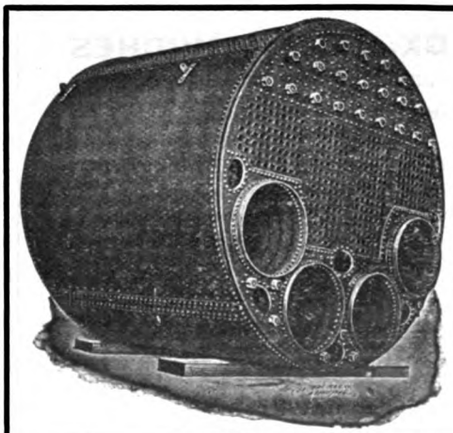

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# BUYERS' DIRECTORY

*Advertisements can be found readily by reference to the Alphabetical Index.*

**AIR COMPRESSION, HOISTS.**
Great Lakes Engineering Works.. .....Detroit.

**AIR PUMPS AND APPLIANCES.**
Fore River Ship & Engine Co..... ..... Quincy, Mass.
Great Lakes Engineering Works... ..... Detroit.

**ANCHORS.**
Admiral Anchor Co.....Chester, Pa.
Bowers, L. M. & Co..... ..... Binghamton, N. Y.

**ANTI-FRICTION METALS.**
Cramp, Wm. & Sons...Philadelphia.

**ANTI-RUST COATINGS.**
Hardy Paint & Varnish Co..... .....Toledo, O.

**ARTIFICIAL DRAFT FOR BOILERS.**
American Ship Building Co..... ..... Cleveland.
Detroit Ship Building Co...Detroit.
Great Lakes Engineering Works... ..... Detroit.

**ASH EJECTORS.**
Great Lake Engineering Works.... ..... Detroit.

**ATTORNEYS AND PROCTORS IN ADMIRALTY.**
Gilchrist, Albert J.....Cleveland.
Goulder, Holding & Masten..... ..... Cleveland.
Hyner, P. D..... ....Erie, Pa.
Hoyt, Dustin & Kelley...Cleveland.
Jenkins, Russell & Eichelberger.... ..... Cleveland.
Kremer, C. E.....Chicago.
MacDonald, Ray G.....Chicago.
Marshall, Alexander..Duluth, Minn.
Shaw, Warren, Cady & Oakes..... ..... Detroit.

**BAROMETERS, MARINE GLASSES, ETC.**
Ritchie, E. S. & Sons..... .....Brookline, Mass.

**BLOCKS, SHEAVES, ETC.**
Boston Lockport Block Co..... ..... Boston, Mass.

**BOAT BUILDERS.**
Drein, Thos., & Son..... .....Wilmington, Del.
Truscott Boat Mfg. Co..... .....St. Joseph, Mich.

**BOILER COMPOUNDS.**
Bird-Archer Co.....New York.

**BOILER MANUFACTURERS.**
Almy Water Tube Boiler Co..... ..... Providence, R. I.
American Ship Building Co..... ..... Cleveland.
Atlantic Works..East Boston, Mass.
Briggs, Marvin.....New York.
Chicago Ship Building Co..Chicago.
Copeland Co., E. T.....New York. (Copeland Scotch Improved.)
Cramp, Wm. & Sons..Philadelphia.
Delany, P. & Co...Newburgh, N. Y.
Detroit Ship Building Co..Detroit.
Fletcher, W. A. & Co..... .....Hoboken, N. J.
Fore River Shipbuilding Co..... .....Quincy, Mass.
Great Lakes Engineering Works... ..... Detroit.
Kingsford Foundry & Machine Works.....Oswego, N. Y.
Maryland Steel Co..... .....Sparrow's Point, Md.
Marine Iron Works.....Chicago.
Milwaukee Dry Dock Co..... ..... Milwaukee.
New York Shipbuilding Co..... .....Camden, N. J.
Quintard Iron Works Co..... .....New York.
Roberts Safety Water Tube Boiler Co..... New York.
Superior Ship Building Co..... .....Superior, Wis.
Toledo Ship Building Co....Toledo.

**BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.**
Falls Hollow Staybolt Co..... .....Cuyahoga Falls, O.

**BRASS GOODS.**
Michigan Lubricator Co.....Detroit.
Penberthy Injector Co..... .....Detroit, Mich.

**BRASS AND BRONZE CASTINGS.**
Cramp, Wm. & Sons...Philadelphia.
Fore River Ship & Engine Co..... .....Quincy, Mass.
Great Lakes Engineering Works... ..... Detroit.

**BRIDGES, BUILDERS OF**
Scherzer Rolling Lift Bridge Co.... ..... Chicago.

**BUCKETS, ORE AND COAL.**
Brown Hoisting & Conveying Machine Co.....Cleveland.

**CABIN AND CABINET FINISHING WOODS.**
Martin-Barriss Co.....Cleveland.

**CABLE GREASE.**
U. S. Graphite Co., Saginaw, Mich.

**CANVAS SPECIALTIES.**
Baker & Co., H. H.....Buffalo.
Upson-Walton Co.....Cleveland.

**CAPSTANS.**
American Ship Windlass Co..... .....Providence, R. I.
Dake Engine Co..... .....Grand Haven, Mich.
Hyde Windlass Co.....Bath, Me.
Marine Iron Wks.....Chicago, Ill.

**CASTINGS (Brass and Bronze).**
Griscom-Spencer Co., New York City.

**CASTINGS (Steel).**
Otis Steel Co.....Cleveland.

**CEMENT, IRON FOR REPAIRING LEAKS.**
Smooth-On Mfg. Co..... .....Jersey City, N. J.

**CHAIN CONVEYORS, HOISTS.**
Brown-Hoisting Machinery Co..... .....Cleveland, O.
General Electric Co..... .....Schenectady, N. Y.

**CHAINS.**
Seneca Chain Co.....Kent, O.

**CHAIN HOISTS.**
Boston & Lockport Block Co..... ..... Boston, Mass.

**CHARTS.**
Penton Publishing Co.....Cleveland.

**CIRCULATORS (Automatic.)**
Copeland Co., E. T.....New York.

**CLOCKS (Marine and Ship's Bell) AND CHRONOMETERS.**
Ritchie, E. S. & Sons..... .....Brookline, Mass.

**COAL PRODUCERS AND SHIPPERS.**
Hanna, M. A. & Co.....Cleveland.
Lorain Coal & Dock Co..... ..... Cleveland.
Pickands, Mather & Co...Cleveland.
Pittsburg Coal Co.....Cleveland.
Toledo Fuel Co.....Toledo, O.

**COAL AND ORE HANDLING MACHINERY.**
Brown-Hoisting Machinery Co..... .....Cleveland.

**COMPASSES.**
Ritchie, E. S. & Son..... .....Brookline, Mass.

**COMPOUNDS—LUBRICATING.**
Cook's Sons, Adam .New York City.

**CONDENSERS.**
Great Lakes Engineering Works... ..... Detroit.
Wheeler Condenser & Engineering Co. .....New York.

**CONTRACTORS FOR PUBLIC WORKS.**
Breymann Bros., G. H.....Toledo.
Buffalo Dredging Co.....Buffalo.
Dunbar & Sullivan Dredging Co.... .....Buffalo.
Griscom-Spencer Co., New York City.
Great Lakes Dredge & Dock Co.... ..... Chicago.
Starke Dredge & Dock Co., C. H... ..... Milwaukee.
Sullivan, M. .....Buffalo.

**CONVEYORS (Portable).**
Spence Mfg. Co.....St. Paul, Minn.

**CORDAGE.**
Baker & Co., H. H.....Buffalo.
Buffalo Ship Chandlery & Supply Co. .....Buffalo.
Columbian Rope Co...Auburn, N. Y.
Samson Cordage Works.Boston, Mass.
Upson-Walton Co.....Cleveland.

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